AMERICAN MACHINIST

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Machines for Filtering by Pressure.

The separation of solids from the liquids in which they are mechanically suspended, is certainly one of the most important steps involved in the processive arts of the refiner. A limpid liquid holding, in mechanical suspension, solids of a higher specific gravity than itself, offers but little resistance to rapid filtration and separation by simple gravity, but the process consumes a greater or less amount of time, varying with the character of the liquid and its contained solid, and this amount of time cannot be shortened.

In cases where the compound is thoroughly affiliated, gravity utterly fails to separate its elements, and pressure through proper filtering media must be resorted to. The bag and press, while performing its work with apparent success, is found, upon closer examination, to be far from perfect. The filtering surface is essentially out of all proper proportion to the bulk of the material being filtered; the interstices of the filter-bag becomes choked by the solids directly in contact with the filter surface, and pressure sufficient to propel the more distinct liquids through these choked-up interstices will inevitably force the outer layer of solid entirely through the filtering material; insufficient pressure leaves the deeper liquids unacted upon, and the entire process but half completed.

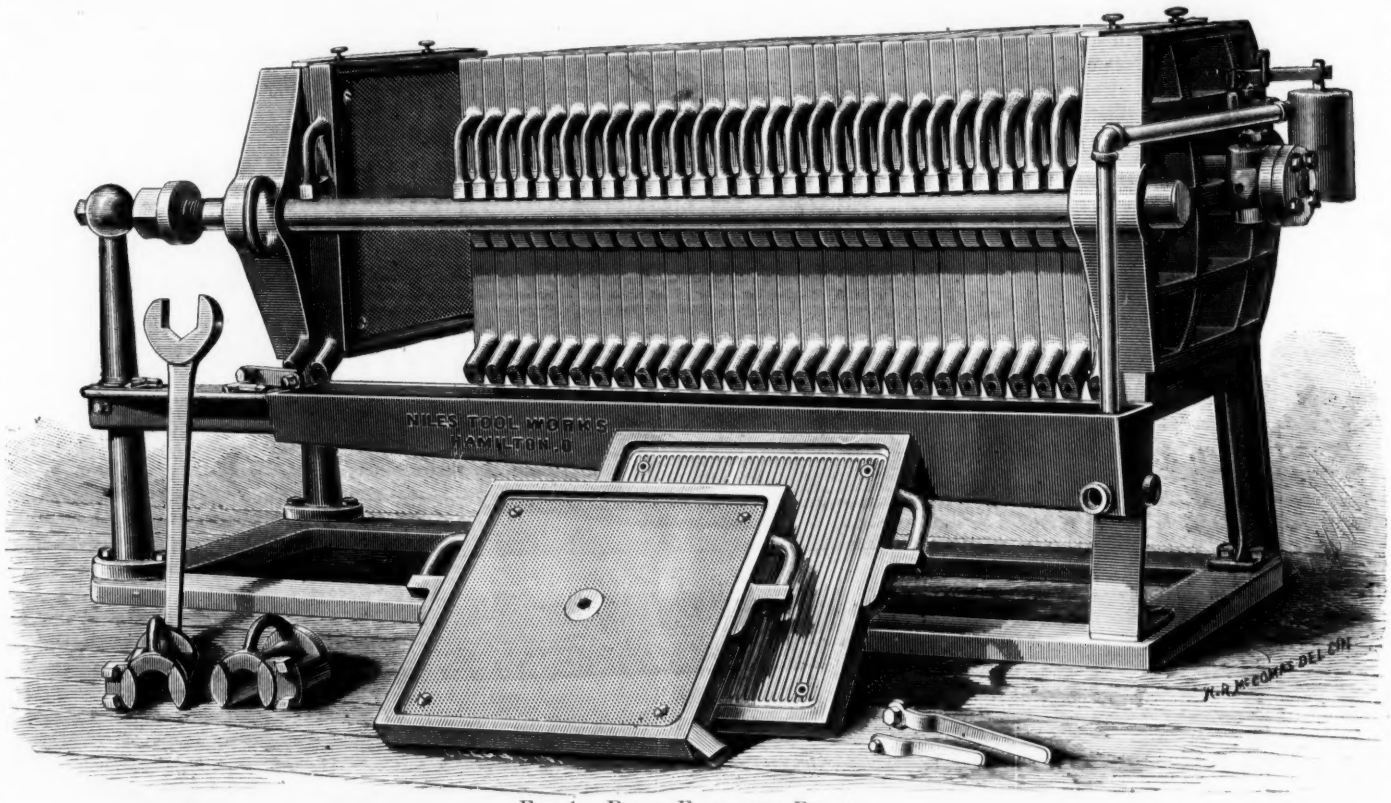

FIG. 1.—PLAIN FILTERING PRESS.

Perfect filtration by means of the bag requires that the process should be often repeated with the same material, and that during the entire processes, the utmost care and patience be exercised. Economy in time must not be sought after, and under the most favorable circumstances perfection of separation must not be expected.

Economy must ever be before the eye of the manufacturer, and this economy must weigh carefully the comparative value of time consumed, and material lost by time saved.

The progress of the arts has developed the filtering machine, which, directly antipodal to the bag press, performs its duties by pressure exerted upon the material instead of upon the filtering media.

The filtering machines which we illustrate herewith, present two square inches of filtering surface to each cubic inch of material being filtered, a proportion twenty times greater than that existing in any other form of filter.

These presses are calculated to be particularly economical and useful to manufacturers of colors, glycerine, parrafine, paper, sugar, etc., and are applicable to nearly all arts which require the separation of liquids from solids, and to many of the processes involving percolation. In the sugar processes they are used for claying the sugar and for the filtration of the syrups, the preliminary filtration through bone black, and the subsequent filtration of the residue of blood coagulation and juice being omitted.

The press consists of a series of filtering cells, lined with suitable filtering cloths and strainers, into which the material is forced by a pump or by a column or head of the material itself. The pressure required will, of course, vary with the nature of the material, and is found to extend all the way from a twelve-inch column of the material to 200 pounds per square inch exerted by a force pump. The separate liquid finds its way from each cell to a trough where it may be led as desired by pipes. The residue remaining in the cells in the form of large slabs or cakes, or thick slush, may be easily and conveniently removed from the cells. The number of cells in each machine can be varied to suit the character of the intended work, and may range from ten to thirty.

The plan of filtration by pressing upon the substance within the filter, instead of upon filtering walls, was first introduced about

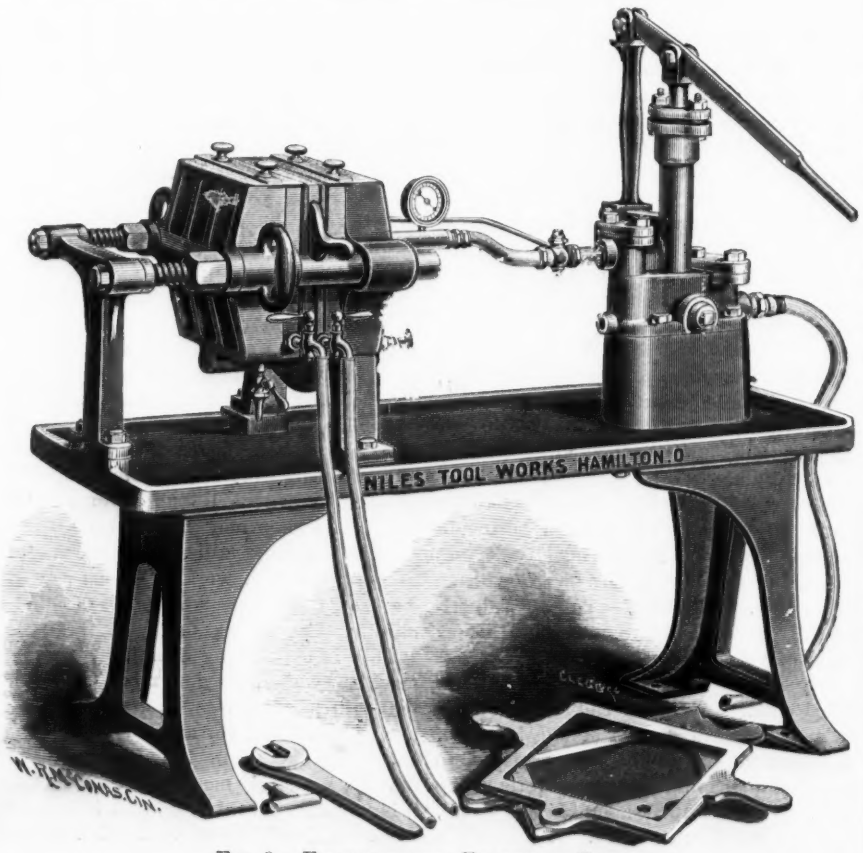

FIG. 3.—EXPERIMENTAL FILTERING PRESS.

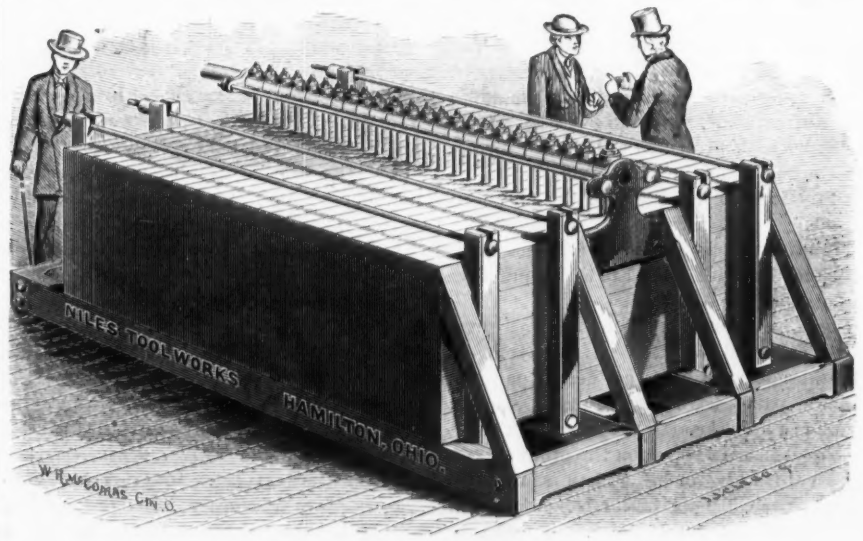

FIG 4.—POTTER'S FILTERING PRESS.

thirty years ago in England, and was confined to drying the feed accumulating in the large breweries, which enabled the brewers to get their semi-liquid slops into solid form for transportation abroad, or for dry storage till better selling seasons returned.

The Niles Tool Works, of Hamilton, Ohio, are the sole manufacturers of these machines in this country, as presented in the engravings on our first and second pages this week.

There are numerous useful applications of filtering presses.

Plain filtering presses, as shown by Fig. 1, for separating liquids from solids, are made of iron for use in manipulating colors, cellulose, chemical precipitates and products, glue, glycerine, oil, printer's ink, and substances requiring similar manipulation for separation.

With wooden chambers they are used in manipulating sundry chemical products, cream of tartar, earth colors of every nature, and a variety of other substances.

Presses with washing and extracting apparatus are used for filtration, percolation, refining, etc., on any substance requiring its precipitate to be washed, or requiring a liquid to extract qualities from a solid, or requiring a solid to recover qualities from a liquid. They are extensively used in the arts. Potter's presses are for filtering large quantities of heavy matter, and are applicable to all the arts handling heavy clayey substances. Similar arts handling smaller quantities of material use the presses as shown in Figs. 1 and 2.

Presses with top admission, as shown in Fig. 2, are for substances which are clayey enough to allow the filtrate to be removed in cakes. Central admission presses drop the filtrate into pans or vats below them.

Presses with heating apparatus are for keeping the substances hot while being operated upon, and should be used where the material refuses to separate cold, or where extraction requires hot solvents. The heating presses are used in the manipulation of cerasine, glue, etc.

Presses with protected outlets are for use in handling liquids of such a volatile nature as to render their exposure to the air undesirable.

Experimental presses are of immense value in connection with every art which practices percolation, filtration, etc.

Fig. 1 represents the plain filtering press partly open and two of the plates removed. The sides of each plate are deeply paneled, and the panels have vertical drain grooves. There is a hole through the center. Perforated plates are laid upon the grooved surfaces and held by screws, a cloth is laid upon the perforated plate and covers the joint surfaces of the main plates. A peculiar fastening makes a tight joint between the cloth and the center of the plate, and at the same time forms a passage through the plate. These plates are placed in the machine and drawn tightly together by the main nuts, resulting in a series of tight, cloth-lined chambers in free communication with each other. The issue spouts connect with the drain grooves, and their outer ends stand over a divided trough in such a manner that a stream of liquid issuing from them will reach the outer trough, but a dripping of thick matter will reach only the inner trough. The head of the machine is provided with an inlet having a safety valve and a pressure gauge. Thick matter being forced into the press by any suitable pump, fills all the chambers; the thin liquid passes through the cloths, through the perforated plates, into the drain grooves, and out at the issue spouts into the outer trough. The liquid runs in clear streams, leaving the solid matter in cakes in the chambers, where it is pressed to nearly perfect dryness. The liquid leaves the trough by pipes, and may be saved or allowed to waste, according to whether the liquid or solid is wanted. The solid is removed by opening the press. In some cases an outlet is put in the tail plate of this press, so that in case the mass within the press can be left in the form of thick slime, it can be washed out by pumping without opening the press. This is the case when the press is used as a refining press for the claying of sugars.

Besides "plain filtering presses," presses are constructed with washing and extracting apparatus. Secondary inlets allow a washing liquid to be forced through the cakes of filtrate within the press, thus removing all traces of acids or alkalies, and leaving the filtrate in a neutral state. If an extract is to be made, the proper solvent takes the place of the washing liquid, and the liquid is passed and repassed through the filtrate till the proper strength is secured.

For substances refusing cold separation, or requiring hot solvents for extracts, steam heating features are introduced into the construction. This keeps the press and its contents at the desired temperature.

For very volatile liquids, such as ether, ammonia, alcohol, etc., the outlet passages are concentrated within the press, and a single outlet is provided. This permits the liquids to flow away without exposure to the air.

Plain presses, with wooden plates, as shown in Fig. 2, are used for substances heavy and clayey enough to settle down quickly. The filtrate may be removed in cakes. The admission is at the top of the filter cells instead of at the center.

Potter's presses, as shown in Fig. 4, are for solidifying potters clay. In principle of construction they are similar to the presses just described. They are built of wood and have from 6 to 40 chambers.

The Experimental Filtering Press is exceedingly useful for testing the utility of filtering presses in connection with any special substance. It is also of great use to parties who sometimes wish to filter a small quantity of a given substance. Many of these machines are used by parties who have regular machines, it being found much more convenient to experiment with a small quantity of a new material than with enough to fill the large machines. This machine has but a single chamber; but each press has three chambers of different depths, to suit various substances. This press contains at one time all the features which are put in any of the presses, it being provided with the features of the plain filtering press, and having, in addition, a steam heating apparatus, a washing and extricating apparatus, and facilities for carrying on its operation without exposing the liquids to the air.

The chambers of all these presses are constructed of material adapted to the material they are to contain, being made in iron, brass, bronze, lead, tin, etc.

All these filtering machines are constructed by the Niles Tool Works, Hamilton, Ohio.

A company has been formed in Paris to establish beet root sugar manufactories in Canada. It proposes to lay out $2,000,000 in the enterprise.

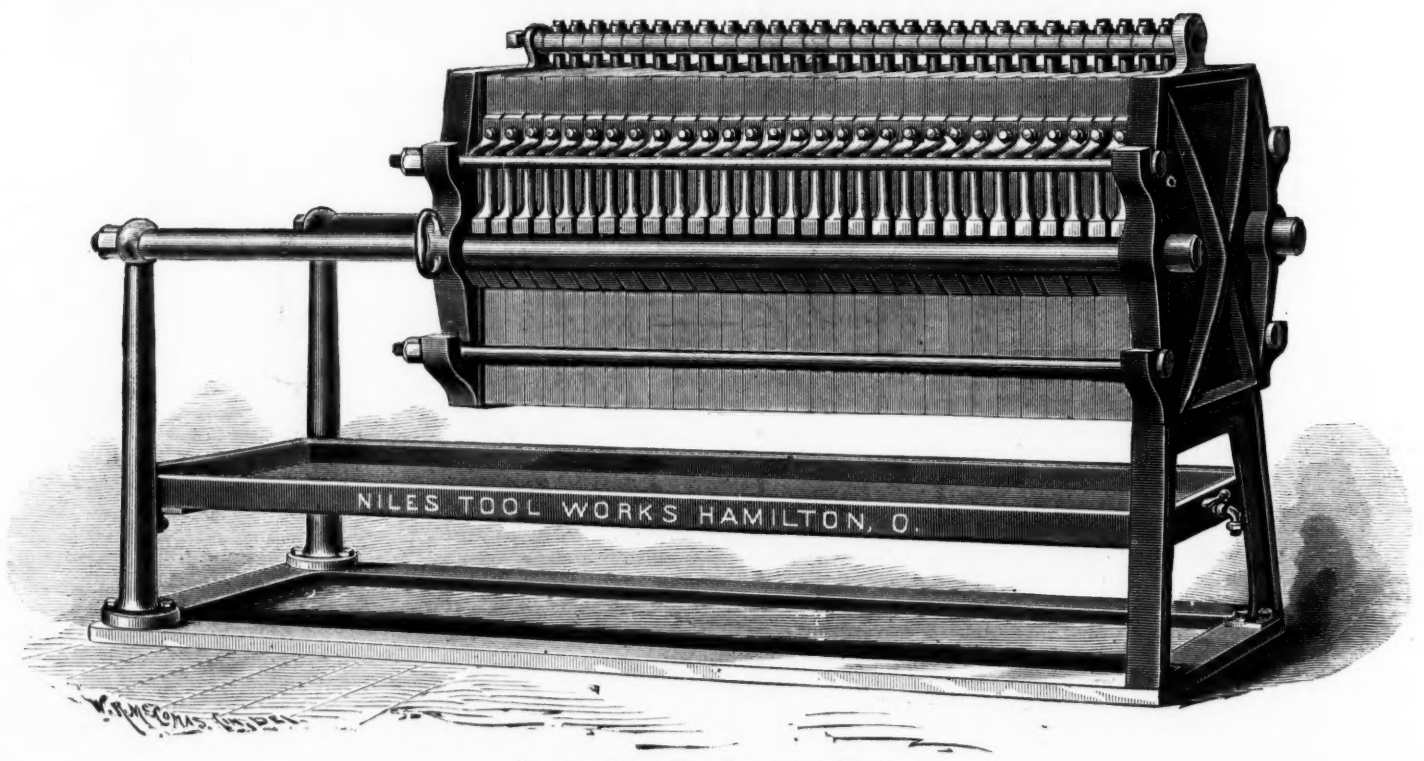

FIG. 2.—WOOD TOP FILTERING PRESS.

Extracts from Chordal's Letters.

Mr. Editor:

* * * * As promised in my last letter, I send you herewith a sketch of the rack which Bennett gives his men for holding drawings. As previously stated, Bennett uses 10 × 13½ inch drawings, exclusively.

This rack is simply a light casting, socketed loosely on to a rod, which is arranged to fasten into the lathe carriage. On the same rod, just under the rack socket, a square cast-iron arm is fitted. The upright rod is shouldered to receive the arm hub and the rack socket.

On the arm slides a light cast-iron cup, which will hold about a quart of water. The mortises, to fit the arm, are cast in the cup; in fact, the work is all gotten up cheaply, though it acts and looks well. A piece of one-eighth inch piping is screwed tightly into a base cast near the bottom of the cup. This pipe reaches out about four inches, and then bends downward with an easy curve. The bent end of this pipe is carefully faced, and provided with a long thread of very fine pitch. On this thread is loosely screwed a brass snoot, having a milled collar at its upper end. By a simple but peculiar arrangement of the inside of this snoot, the end of the pipe is adapted to seat against a shoulder and thus form a stop valve. Turning the snoot by the collar, regulates the flow of water. It is simply a cheap and substantial form of cock. Bennett puts these complete things on lathes, planers, shapers and slotters, and he uses a similar rig, minus the water works, for drill presses, vises, boring mills, gear cutters, pattern lathes, and all other machines. It is no slouch of an arrangement, and, being made in a lot, they are very much cheaper than the hap-hazard thing we usually see. Come to think of it, I don't remember ever having seen any other shop provided with any kind of water cans, except such as each lathesman seems to have conjured up himself.

* * * * In speaking of shop drawings, I take Sackett's drawings as models, because he seems to have got things reduced to a smooth working system. I have noticed the system of drawings used in many of our finest shops, but, in almost every case, it looks as though little attention had been paid to any regular plan. This, of course, has no reference to the character of the work shown on the drawings, or to the character of the draughtsman's work. I am speaking of the drawings themselves, as drawings, and with reference to their functions in the shop.

* * * * I will first briefly refer to Sackett's symbolism. Nearly all good shops symbolize their work, but some do not, and ever so many bad shops do nothing which will save work. Symbolism saves in the drawing room, in the pattern shop, in the pattern store room, in the foundry, in the machine shop, and in the office. I do not believe it possible to keep stored patterns in come-atable shape, without some symbolical system of marking them.

* * * * Symbols are only of real value in shops which build something regularly. Take the case of a shop building threshing machines, fanning mills, and sugar mills. It is almost impossible to stamp such a word as "Thresher" on little patterns, and they must be marked for identification to avoid a mix. Under a system of symbols, a single letter will be chosen to typify a *class* of machines, as A, for threshers, B, for fanning mills, and C, for sugar mills. In this way, any pattern, piece of a pattern, core box, drawing, or casting, marked B, is at once known as belonging to a fanning mill. The shop may make two kinds or sizes of fanning mills. It thus becomes necessary to mark work in such a way that we may know just what style of fanning mill the thing belongs to.

This is effected by combining with the machine symbol, a style symbol. Thus fanning-mill patterns may be marked B 1, for one style, and B 2 for another style, and so on. The figure 2 in the last case doesn't show that B 2 is a larger machine than B 1, or that it is a smaller machine, or that it is a later style. It simply shows that it is a *different* fanning mill from B 1.

If, in course of time, B 1 is radically altered, it takes a new symbol like B 3, for instance, indicating that it is not B 1. B 3 is a machine made in conformity with B 3 drawings, cast from B 3 patterns, and run on the cost books as B 3. Under this system, the men in the shop will cease to speak of the little fanning-mill or the big fanning-mill, and will only talk of B 1, or B 2, etc.

A stranger don't know what the men are talking about in a symbol shop, and he don't need to care. A new workman drops into the thing very quickly.

* * * * Every piece of drawing, or pattern referring to B 3, will be marked B 3. B 3 patterns will be kept in a space devoted to B 3, and if they get mislaid, their place is easily found. The men keep time on B 3, instead of on some kind of a fanning-mill, and the time-keeper's book deals with B 3.

* * * * The machine not only has a symbol, but each piece has a designating number. The draughtsman puts the number on the drawing of the piece; the pattern-maker stamps it on the pattern of that piece, and on all loose pieces of that pattern, and on all core boxes for that piece. Time is kept on that piece, and castings are ordered by the number as well as symbol. The draughtsman marks a certain gear No. 1, and another gear No. 2, and so on. If castings are wanted, it is not necessary to show the pattern, or to describe the shape of it. The order is simply made for B 3, No. 2, and this will be found stamped on the proper pattern. Time is kept by number as well as symbol. A lathesman's slate may read: "Boring 40 pcs. B 3, No. 28, 9 hours." This would cover a slate, if written in full, and would wear out a time-keeper.

* * * * Many shops use the piece numbers in such a way as to indicate the material the piece is to be made of.

Thus a drawing marked No. 3, No. 22, No. 16, would mean that the pieces were to be of cast-iron. If marked No. 03, No. 022, No. 016, it means wrought-iron or steel, it don't make any difference which, as the blacksmith's drawings tell him which it is. Machinists know that any piece marked 02 is to be made of a forging. No. 003, No. 0022, etc., mean brass. No. 0003, No. 00022, mean wood. No. 00003, malleable iron, and so on, as may be adopted. It is customary to use the last kind of numbering for all rare materials, such as malleable iron, if rarely used, leather, rubber, and special metals, thus indicating that the piece is not made of common material, and the drawing will define what it is to be made of.

* * * * I do not intend to say much about Sackett's instruction to his draughtsmen, regarding the execution of the drawings, but, as part of the system, I should explain that no one but the pattern maker is ever to measure a drawing. He never has to do so but once, and he can measure closely to any scale. But if machinists ever measure drawings, there is no telling what will happen. No two men measure alike, and, as a consequence, the drawing would be subjected to a dozen different translations.

For this reason, a drawing should show *figured* dimensions wherever it is to be brought to a size. Parts which are not to be touched by machinists, have no dimensions given. Sometimes a place is to be turned or finished, and at the same time it may make no difference about its distance or dimension. If a dimension is marked on such a place, a man will use up as much time bringing the piece to figured size, as if it was very important. Figures are not put on such places. The simple word "plane," or "face," or "polish," and the absence of figures, will show the dimension or distance is immaterial.

* * * * I could say a great deal more about this, but will defer it, and will then speak also of the drawings for the blacksmith shop, boiler shop, wood shop, &c. All such drawings are liable to be used for one machine, and all are the same size, and bear the same symbol. I may also speak of a record system, belonging to the drawings, whereby a history of alterations may be had. All this business looks like work, but there is no point where "save work" comes in to better advantage, than in the arrangement of shop drawings; and a decided system of drawings will pay, many times over, for its cost.

* * * * As before stated, Sackett pastes a back on each drawing card. These backs are of such size as to meet and lap over the margin. I here show the back work of one of Sackett's drawings. The upper section is printed separately, and if a machine requires but five or six drawing cards, the draughtsman makes this section himself. If ten or more are needed, printing is the nicest and cheapest. The symbol is brought out very boldly, as shown, so that drawings may be easily identified. The balance of this thing is printed in one piece, and all is pasted on before the drawing is varnished.

* * * *

Very Respectfully,
CHORDAL.

The Hudson River Tunnel Company keep on blundering as before.

BENNETT'S DRAWING RACK. (SEE PAGE 2.)

H, 6.

6x10 Inch Portable Engine. March, 1880.

INSTRUCTIONS.

TO PATTERN MAKERS.

A plain number, as No. 7, means cast-iron. If preceded by a cipher, as No. 07, it means wrought work. If preceded by two ciphers, as No. 007, it means brass. If preceded by three ciphers, it means wood-work. Patterns are wanted for cast-iron and brass pieces.

Measure and make your own allowance for shrinkage and draft.

Holes with no sizes given are to be cored to size.

Do not measure where figures are given.

Always add for finish, when figures are given. Add for finish when you find the word "polish," or "face."

Where two views are shown, the size is generally marked in but one place, the same with holes of the same character. Look out for this.

Don't forget the fillets and rounds on all rough work.

Mark all patterns, coreboxes and pieces, with the symbol and number.

If one pattern makes two pieces with additions, put both numbers on the piece used for the two.

TO BLACKSMITHS.

If there are forging sheets, work to the figures and to the shapes shown by the red outlines. If there is no red outline, the piece is not to be finished and calls for a smoother forging. If there are no forging sheets, make forgings from working drawings to order only and leave finish where figures are given.

TO MACHINISTS.

Do not finish where there are no figures, unless you find the word "finish," or "polish," or have special instructions.

Where nuts and boltheads come down on rough castings, you will counter-bore the surface so as to allow them to come down square.

Counter-sink the first thread out of all tapped holes, not with a drill but a hand counter sink.

Touch all bolt holes lightly, with the same tool.

Chamfer the first thread off of all screws before trying them in a hole.

Leave no ragged corners. Where a corner is formed by a rough surface and a finished one, round the corner nicely and boldly.

A hole marked "tap" is to have a thread in it, either tapped or chased.

All screws are standard thread and right hand V unless otherwise mentioned.

All key seats are to be in depth one-half their width, and straight, unless otherwise stated,

Don't polish any work not marked polish, except on special instructions.

Don't touch a tool to any part not figured unless you find the word "polish" or "face." If the word "polish" is placed after the number of the piece, it means polish all over the outside.

Where a hole to be drilled is shown and no distances are given, it is either to be scribed from some other piece, or is to be in the center of a boss.

Make all fits by varying the size of the internal piece. Let all holes be standard.

SHERMAN G. SACKETT, - - - - - Proprietor.

Ohio Valley Iron Works,

CINCINNATI, O.

Compressing Steel in the Moulds.

From a paper read by Mr. S. Davis, before the British Institution of Mechanical Engineers, we condense the following:

The unsoundness of steel castings, particularly in the case of ingots made by the Bessemer or Siemens-Martin process, has given manufacturers considerable trouble, and occasions much waste of material. It appears now to be generally conceded that the defects proceed from two distinct causes: First, the existence of gases, generated at the point of transition from the fluid to the solid state, which are imprisoned in the form of bubbles when the surrounding metal becomes solid; and secondly, the existence of spaces formed by the natural contraction of the metal in cooling, by reason of the outer skin first becoming solid, and refusing to follow up the interior portion of the ingot, which subsequently cools, and consequently occupies a smaller space.

Various methods have been invented for making the castings sound, but that adopted at Barrow has the merit of simplicity.

A high-pressure steam-boiler is provided, and communicates with a receiver, which is attached to the side of the ingot crane, and which is furnished with a row of cocks corresponding with the number of ingot moulds. From these cocks, strong india rubber pipes convey the steam to the ingot moulds, which are arranged in the arc of a circle round the ladle crane. The metal from the ladle is poured through a loose pouring cup, which rests on a conical seat at the top of the ingot mould. As soon as the pouring is finished, this cup is removed, and a lid, having the steam-pipe ready coupled to it, is placed on the top of the mould, and secured to it by a steam cotter. The cock on the receiver is then opened, and the steam allowed to act upon the metal until it has completely set. The result of this pressure is to make the ingot sensibly shorter than when cast in the ordinary manner, the difference, according to experiments made at the Edgar Thomson Works, being from 1½ in. to 2 in. in a 5 ft. or 6 ft. ingot. The ingots when cold are perfectly level at the top, and there is no porous head requiring to be cut off.

Each ingot mould is provided with a steam-tight cover, having a wrought iron pipe attached to it, furnished with a stop-cock. This pipe communicates at right angles with the main steam pipe, which runs parallel with the side of the dock. The junction of the branch steam pipes with the main is formed by means of a cast iron sleeve-piece, with stuffing-boxes, to enable the covers, with their respective cocks, to be thrown back out of the way when not in use.

The boiler for supplying the steam is 3 ft. 6 in. in diameter, and 9 ft. high, and is intended to be worked at a pressure of 200 lb. per square inch. The presence of the steam also acts beneficially on the side of the mould, and causes it to last longer. The pressure necessary to produce a perfectly sound ingot will depend upon the quality of steel to which it is applied. It is found that for ordinary rail metal, 100 lbs. per square inch is sufficient. But for milder steel a higher pressure is needed.

The question of making tight joints between the ingot moulds and covers with high pressures is one of considerable importance. In cases where high pressures are needed for the consolidation of fluid metals, the author proposes the use of compressed air. With this system a pressure up to 1,500 lbs. or 2,000 lbs. per square inch may be obtained without danger or difficulty.

A new use for glass is found in the manufacture of window shutters. These are now made of opal glass, decorated, and have the important advantages of being beautiful, and easy to keep clean.

Ithaca, N. Y., wants a narrow gauge railroad built to Olcott, on the lake shore. The cost would be $100,000. A line of steamers would then, undoubtedly, be put upon the lake between Olcott and Toronto.

Officers and Membership of the American Society of Mechanical Engineers.

We present herewith the full list of officers and members of the new National Society of Mechanical Engineers, obtained from advance sheets of the catalogue about to be issued. Our readers will remember that this Society had its origin in a preliminary meeting held in the office of the AMERICAN MACHINIST, February 16, 1880, the final organization being completed April 7, 1880. The Rules were published entire in our issue of April 24th, last:

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Firmstone, F., Glendon Iron Works, Easton, Pa.
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Crosby's Pop Valve.

We present in Fig. 1, a half-size view of Crosby's Adjustable Pop Safety Valve, as designed for locomotive use.

The valve proper rests upon two flat annular seats, on the same plane, and is held down against the pressure of steam by a steel spiral spring. The tension of this spring is regulated by the threaded bolt at the top of the cylinder *K*. The area contained between the seats *W* and *V*, is what the steam pressure ordinarily acts upon to overcome the resistance of the spring.

The large seat is formed on the upper edge of the shell or body of the valve *A A*. The smaller seat is formed on the upper edge of a cylindrical chamber or well *C C*, which is situated in the center of the shell or body of the valve, and is held in its place by four arms, *D D*, radiating horizontally at right angles to each other, and connecting it with the body or shell of the valve. These arms are hollow and form four passages for the escape of the steam or other fluid from the well into the air, when the valve is open. This well is deepened so as to allow the wings, *X X*, of the valve proper to project down into it far enough to act as guides.

When the pressure under the valve is within about one pound of the maximum pressure required, the valve will open slightly, and the steam will escape under the larger seat into the cylinder surrounding the spring, thence into the air; the steam is also forced under the smaller seat into the well and thence through the passages in the arms into the air. As soon as the pressure attains the exact maximum point, the valve will be lifted so high that the steam will rush into the well faster than it can escape through the apertures in the arms; a pressure will then accumulate under the inner seat *W W*, and acting upon the additional area presented, force the valve wide open and rapidly relieve the boiler. The valve then continues to settle down, until the area of the opening under the smaller or inner seat is less than the area of the apertures in the arms for the escape of the steam; the pressure then ceases and the valve closes. The point of opening can be readily changed, while under steam, by adjusting the threaded bolt at the top of the cylinder, and the point of closing is as easily changed by screwing up or down the ring *G G*, surrounding the body of valve.

The seats of the valve and of the shell are ground separately, on flat surfaces, to a perfect plane. It is claimed that these flat seats are more durable and do not leak so readily as beveled seats.

Several different styles of these pop valves are manufactured for special purposes, a few of which are shown here. Fig. 2 represents this valve as designed for stationary or steamboat boilers, with lock-up device and side outlet. It is also made with top outlet, and fitted with lifting lever. Fig. 3 illustrates a smaller size, as designed for portable boilers of various kinds, such as steam fire engines, grain threshers, hoisters, and portable saw mills.

The manufacturers are the Crosby Steam Gage and Valve Co., cor. Milk and Battery-march Sts., Boston, Mass. They claim that the effective area, while discharging under 100 pounds pressure, of their 2½ inch valve, is .98175 square inches, which is ⅛th of the whole area of valve.

To HARDEN STEEL.—A very fine preparation for making steel very hard is composed of wheat flour, salt and water, using say two teaspoons full of water, one-half a teaspoon full of flour, and one of salt; heat the steel to be hardened enough to coat it with the paste—by immersing it in the composition—after which heat it to a cherry red and plunge it in cold soft water. If properly done, the steel will come out with a beautiful white surface. It is said that stubbs files are hardened in this manner.

FIG. 2.

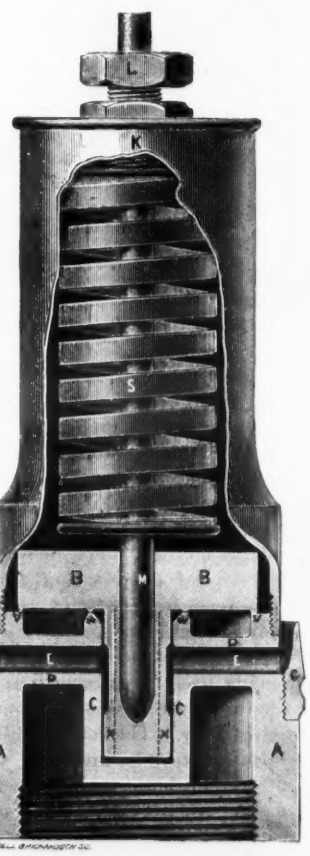


FIG. 1.

FIG. 3.

A strike of the mechanics employed by the Chicago & St. Paul R.R. at Milwaukee, Wis., took place August 25th. About 400 men went out of the new machine shops, making the works idle with 20 engines and much other work in an unfinished state. The strike had been threatened for a month and frequent conferences had been held, the mechanics claiming that they were receiving less than the compensation of other shops in the West. The wages range from $1.50 to $3.50 per day. The men are stimulated by the knowledge that all the machine shops are busy day and night, and mechanics are in good demand.

Their request was for an advance of ten per cent.

A man living in Astoria, N. Y., has designed a water-velocipede, which is now being built. It consists of two long narrow tin boats placed parallel a short distance apart, and fastened together with a raised seat in the center of equilibrium. The motive power is supplied by an ordinary velocipede wheel with sheet iron paddles attached, to be worked by the rider's feet from the seat.

Elementary Principles of the Steam Engine.

BY CHAS. E. EMERY, PH. D.

It is common to look upon the steam engine simply as a highly useful piece of mechanism capable of supplying motive force at such times, and in such quantities, as may be desired, and, therefore, vastly superior to the uncertain action of natural forces and those derived from the limited and intermittent muscular exertions of animals. The value of this form of mechanism in enabling man to extend his manufactures and overcome distance and natural difficulties are well understood and acknowledged, and it appears also that the steam engine, by reducing the necessity of many forms of physical exertion, enables a large portion of mankind to rise to a higher plane in which mental and physical labor are combined, which, with the increased facilities for communication and interchange of thought and experience, constantly tend to a higher average of comfort and civilization.

To, however, thoroughly understand the the steam engine and appreciate its advantages, it is necessary to examine, not only the details of its construcion and its mode of operation as a machine, but to ascertain the principles upon which its action is founded, and their conformity with general physical laws.

Such an investigation, though interesting and instructive, involves so many details in different branches of science, that it is expected in these lectures to refer only to the distinguishing features, leaving, for individual examination, points which appear of special interest.

It is necessary, at the outset, to explain the meaning of terms which will be frequently used.

The term "mass" refers to the quantity of matter in an object, independent of the action of gravitation on the same. It is considered equivalent to the weight of an object at the sea level. At a higher elevation the force of gravitation is less, so the weight is a little less, measured by a spring balance. The difference, however, is so small that the weight only will usually be considered.

The terms force, work, power, &c., are often used popularly in very nearly the same sense, the first, in the singular or plural form, being the most general term, and applied to indicate force or exertion in various forms.

Throughout this article, force will be considered simply as the effort or exertion which produces or tends to produce motion, or change of condition, which will be measured in pounds. All measurement will be referred to English units, it being understood that the same are readily convertible, and often expressed in other units, particularly those of the metric system. We speak of the force of gravity which is measured by the weight of an object, and muscular and other forces, the intensity of which can always be ascertained and measured. The pressure of a fluid is measured by pounds per square inch, so the total pressure on a given surface—that of a steam piston, for instance—is a force tending to urge it forward.

Motion will be considered measured by the distance moved in feet; and velocity, or the distance moved in a unit of time, by the number of feet moved per second.

"Work" is the term applied to force moved through distance, and is measured in foot pounds, a compound unit derived from those of force and motion, respectively. For instance, if a person weighing 100 lbs. lifts himself vertically one foot, the exertion represents 100 foot-pounds of work. It should, however, be understood by beginners that it is not necessary to lift a weight to perform work. In pushing a spade into the ground, urging forward a steam piston, or dragging a load, there is a measurable force acting through a measurable distance, and the work done in foot-pounds is represented by the product of the two. In pushing a load horizontally, the work done is not equal to the product of the weight into the distance

moved. The resistance to be overcome in that case is caused entirely by friction, and the work is represented by the product of the force required to overcome such friction into the distance the weight is moved. Power is the work done in a unit of time. The unit is one horse-power, which is considered equal to 33,000 foot-pounds per minute. For instance, if a horse or an engine overcome a resistance requiring the exertion of a force of 165 pounds, through a distance of 200 feet, there will be done (200×165), 33,000 foot-pounds of work, and if this be accomplished in a minute, the effort will require one horse-power. To do the same work in three minutes would evidently require but one third horse-power.

Energy means capacity for performing work, and is expressed, like work, by the product of a force into a distance. It is distinguished as potential energy and actual energy; the former referring to the energy of an effort, and representing the work stored up, which the object referred to is capable of performing; the latter, the work which will be performed by a moving body in overcoming resistance. If a weight of 100 lbs. be suspended 20 feet above the earth, its potential energy in all is (20×100) 2,000 foot-pounds, because, disregarding friction, it is capable of doing that amount of work in descending. If, however, the suspending rope be cut, and the weight permitted to fall under the influence of gravity, the velocity will increase rapidly, and though the amount of energy stored up remains the same, so long as the fall is uninterrupted, it has taken the active form of mass in motion, and will, on being brought to rest, develop actual energy in overcoming resistance exactly equal to the work required to lift it from the final to the original position. The energy is potential while the weight is at rest in the elevated position, and is still potential while descending freely in the active form of mass in motion. The latter phase of potential energy, viz: that during free descent, has been called kinetic energy, an excellent term so long as it is not confounded with the actual energy resulting when the weight is brought to rest.

When the energy exerted by any motor is continuously employed in overcoming resistance, as in driving a machine, or propelling a vessel at uniform speed. it is equal to the work performed. When the speed is retarded by overloading, the potential energy due to the velocity is transmitted into actual energy to assist in overcoming the resistance. As the speed is increased, the potential energy is increased, the difference in velocity varying, according to known laws, with the difference between the energy exerted, and that directly absorbed in the performance of work. The fly-wheel of an engine assists in rendering the speed practically uniform, under the intermittent action of the steam on the piston, and the sudden variations of the load found in practice.

We have seen that potential energy may remain latent or inactive, like a compressed spring, ready to act when released, or may take the active form of kinetic energy or motion. It has been demonstrated that the physical forces: heat, light, and electricity, are but varieties, or modes of motion, of the atoms or molecules of matter, and are co-related to each, and to the visible motion of masses; that is, one may be converted or transmuted into either of the others. The vital forces are in the same way co-related to the physical forces, all that can be examined of the latter being, in fact, but physical force under the mysterious control of the human soul. It is now well settled that in all the complex operations in the universe, neither matter nor energy is actually destroyed, though the form and method of manifestation of either may be frequently changed—matter into some other form of matter, and energy into another form of energy. As respects the latter, the relation between heat and motion is the most accurately known. Count Rumford, an American employed at Munich, announced in 1798, experiments in boring cannon, from which he concluded that heat must be motion.

In 1842, Dr. Mayer, of Germany, calculated the relation from the differences between the specific heat of air at constant temperature and at constant volume, and, soon after, Mr. Joule, of England, found the mechanical equivalent of one heat unit to be 772 foot pounds, which is known as Joule's equivalent. A heat unit is the quantity of heat required to raise the temperature of one pound of water, at or near the freezing point, one degree.

We quote, with slight alteration, from a lecture by Prof. Barker, some illustrations, showing the great fact of the convertibility of force. "Starting with actual visible motion, co-relation requires that when it disappears as motion, it should reappear as heat, light, or electrtcity. If the moving body be elastic, like a rubber ball, then its motion is not destroyed when it strikes, but is only changed in direction. But if it be non-elastic, like a ball of lead, then it does not rebound; its motion is converted into heat. The motion of this sledge hammer, for example, which, if received upon an anvil, would be simply changed in direction, if allowed to fall upon a bar of lead, is converted into heat; the evidence of which is, that a piece of phosphorus placed upon the lead is at once inflamed. So, too, if motion be arrested by the cushion of air in this cylinder, the heat evolved fires the tinder carried in the plunger. But it is not necessary that the arrest of motion should be sudden, it may be gradual, as in the case of friction. If this cylinder, containing water or alcohol, be caused to revolve rapidly between the two sides of this wooden rubber, the heat due to the arrested motion will raise the temperature of the liquid to the boiling point, and the cork will be expelled. But motion may be also converted into electricity. Indeed, electricity is always the result of friction between heterogeneous particles. When this piece of hard rubber, for example, is rubbed with the fur of a cat, it is at once electrified; and now, if it be caused to communicate a portion of its charge to this glass plate, to which, at the same time, we add the mechanical motion of rotation, the strong sparks produced give evidence of the conversion. So, too, taking heat as the initial force, motion, light, electricity, may be produced."

In every steam engine the quantity of heat which is carried out of the cylinder with the steam, independent of the fall of pressure due to the change of tension, is less than that which entered it, the difference representing the exact amount of work done. "The conversion of heat into electricity, is also easily effected. When the junction of two metals is heated, electricity is developed. Moreover, heat and light have the very closest analogy; exalt the rapidity with which the molecules move, and light appears, the difference being only one of intensity.

"Again, if electricity be our starting point, we may accomplish its conversion into other forces. Heat results whenever its passage is interrupted or resisted; a wire of the poorly conducting metal, platinum, becoming even red hot by the converted electricity. To produce light, of course, we need only to intensify this action; the brightest artificial light known results from a direct conversion of electricity."

"Professor Julius Thomsen, of Copenhagen, has fixed, experimentally, the mechanical equivalent of light. He finds that the energy of the light of a spermaceti candle, burning 126½ grains per hour, is equal in mechanical value to 13.1 foot pounds per minute. The same conclusion has been reached by Mr. Farmer, of Boston, from different data."

It should be borne in mind, however, that the conversion of one form of force into another is, except in the case of motion into heat, rarely perfect. In some cases, several forces appear simultaneously, heat particularly showing itself prominently in connection with the transformation of energy into light or electricity. The conversion of heat into mechanical work by means of a steam, or other form of heat engine, is also very wasteful, the best steam engines utilizing only about one-sixth of the heat in the steam, and but one ninth of the calorific value of the coal, ordinary performance being very much lower, the reasons for which will appear hereafter.

There are also strong evidences of the co-relation of the vital with the physical forces, in which connection we would call attention, again, in the words of Prof. Barker, to the "different, and, at the same time, the co-ordinate purposes subserved by the two great kingdoms of nature. The food of the plant is matter whose energy is all expended; it is a fallen weight. But the plant-organism receives it, exposes it to the sun's ray, and, in a way yet mysterious to us, converts the actual energy of the sunlight into potential energy within it. The fallen weight is thus raised, and energy is stored up in substances which now are alone competent to become the food of the animal. This food is not such because any new atoms have been added to it; it is food because it contains within it potential energy which at any time may become actual as force. This food the animal now appropriates; he brings it in contact with oxygen, and the potential energy becomes actual; he cuts the string, the weight falls, and what was just now only attraction, has become actual force; this force, he uses for his own purposes, and hands back the oxidized matter, the fallen weight, to the plant to be again de-oxidized, to be again raised. The plant, then, is to be regarded as a machine for converting sunlight into potential energy; the animal, a machine for setting the potential energy free as actual, and economizing it."

(To be concluded next week.)

COMBINED FOOT POWER MACHINE.

The Swedish government has determined to organize its whole army and equip it with the best modern breech-loaders. American manufacturers will be invited to send over specimens, and very heavy contracts are probable.

Combined Wood-Working Machine.

Some time ago we illustrated a foot power forming machine, and its attachments, manufactured by W. F. & John Barnes, Rockford, Ill. With the present issue, we show engravings of a combined sawing and boring machine, manufactured by the same firm.

The table is 28 inches square, and stands 35 inches from the floor. On one side is a scroll saw, with cast iron frame. The swing around the 7-inch blade is 24 inches. Near the center is a circular saw, which can be run entirely independent of the scroll saw, or the scroll saw can be used without the other. The mandrel of circular saw is so set in its bearings that the whole can be put on the table or removed very quickly. If two mandrels are used, one carrying a rip-saw, and the other a cross-cut, no time need be lost in transferring.

The table to the right of the saw is mounted on true planed iron ways. On this table the material is placed at any desired angle, and moved to the saw with perfect accuracy. All varieties of joint work can be done truly and rapidly. The ripping gauge can be used on either side of the saw, as occasion may require. The table is adjusted up or down by a screw, to allow any desired depth of cut being made by the saws or cutter tools.

The large cut on page 7 shows a boring attachment on the same machine, by which it is enabled to do a great variety of work in drilling and boring. A drill chuck is furnished with this attachment, so any ordinary carpenter's bit may be used, by cutting off the square part.

Directly in front of the drill shaft is shown a sliding table on which the work is placed. This moves on substantial ways, which carry the material uniformly to the auger or bit. It also has a stop to govern the depth of hole. For hard wood and large bits, the speed is reduced and the power increased by an arrangement of gear wheels. For small holes and light boring, the gear is not used, as high speed is gained by the use of the belt only.

The three engravings, marked Nos. 1, 2 and 3, are special forms of cutter heads, designed for use on the saw mandrel in working grooves, and the like, in wood, either with the grain or crosswise. No. 2 is intended for cutting across the end of boards, as in cutting stuff for boxes and drawers. We show, in another engraving, the table arranged with this cutter on mandrel to make tongue and grooves for boxes. Samples of the work are also shown.

The miter attachment is intended for use

on the sliding portion of the table of combined machine. It is very handy for making frames and mouldings.

A correspondent of the London *Musical World* says:

"The use of gold in the construction of musical instruments, never yet thoroughly investigated, offers an interesting field for experiment. Four metals are distinguished as being capable of being hardened to spring temper, and in that state possess more or less powers of vibration. Steel, hardened by tempering, is used for pianoforte strings. Brass is hardened by drawing down or flatting, but its elasticity is not equal to steel. Nickel can also be drawn or flatted, and possesses great springiness; but no metal, either in a pure state, or mixed with other metals, equals gold, if combined with copper, silver, or both, for ductility and power of vibration. A spiral spring, made of fifteen carat gold—that is, fifteen parts of fine gold to nine parts of copper, drawn into wire—possesses more 'springiness.' Many years ago, I superintended the manufacture of some gold wire on this principle, as a string upon an ordinary pianoforte, and the results were marked. Not only was tone considerably increased, but its quality materially improved. With the thinner and shorter strings, this was so noticeable, that it is surprising the idea should not have suggested itself to others. Fifteen carat wire, drawn down at least six holes after softening, answers best. I have also suggested the use of gold for the vibrating tongues of the harmonium, concertina, and other instruments of the kind. Some time ago, I asked an amateur zither player to try the effect of gold wire upon his instrument, and he has since assured me that the increase in tone is so remarkable that he has substituted it for the steel strings with complete success. I think the idea is one that merits further inquiry. The expense (if advantages are to be gained), should not deter those most interested in the matter. The harmonium tongues are made so thin that little extra outlay would be required, and with small loss, seeing that the old gold can be remelted. Let any one take a disk of steel, the size and thickness of a sovereign, throw it on to a wooden table, so as to make it ring, then take a sovereign and beat it in the same way. The first will have a dull sound, as if the metal were cracked, and the second a bright, metallic bell like ring. A still better test is to throw a piece of steel band on the floor, listen to the vibrations, then do the same with a strip of gold of the same size and density. Gold has been used for the strings of the virginal, with what effect I cannot say. Everything depends upon the gold being alloyed and hardened by drawing down to the desired condition in which it will stand nearly the same tension as steel."

Letters from Practical Men.

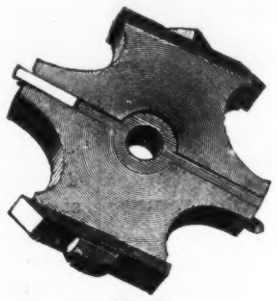
ON BELTING.

Editor American Machinist:

In my letter of July 31st, I fear that my endeavor to be brief resulted in obscurity. By the two pulls that I spoke of, I meant the two pulls due to the tension of the belt when at rest. Mr. Rose must have misunderstood my use of the word pull, for he will readily grant that, when the belt is at rest, there is a strain in both directions, and, if one strain is greater than the other, the pulley will turn accordingly. Therefore, there is always a tension, strain, or pull, on the slack side, as well as on the tight side, when in motion. The tension on the slack side, when in motion, is a little greater that the tension on the same side when at rest. This is due in part to the increase in weight of the slack side, and partly to the slipping of the belt on the pulley. But this tension is not very much greater in motion than when in rest; therefore, in its effect on the driving power of the belt, it may be considered as the same at all times. This tension is due wholly to the weight and elasticity of the belt. In AMERICAN MACHINIST, No. 34, Mr. Rose says:

No. 1.

No. 2.



No. 3.

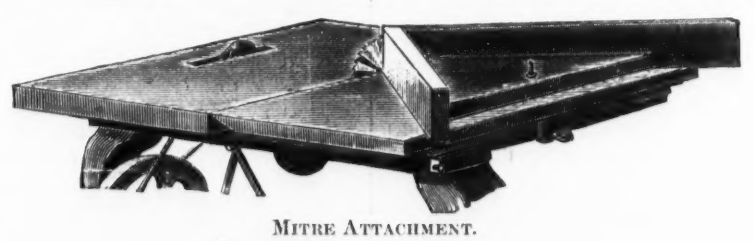
HONEY BOX.

"What I wish the advocates of the arc-of-contact theory to give me, is some reason why increasing the arc of contact increases the driving power of a belt, which reason shall not apply as directly to the increase of area, as to the increase of the arc of contact."

In my last letter, I endeavored to *suggest* that very reason. Now, I will try to *demonstrate*, as a fact, that, increasing the arc of contact of a belt increases the driving power of that belt, independently of the area of contact. Allow me to say here that I lay no claim to originality in a demonstration of a well-established mechanical principle. I only hope to interest some who have not studied applied mechanics as a mathematical science, and who do not therefore quite understand the why and wherefore of the question.

BORING ATTACHMENT ON COMBINED MACHINE.

Let *A* be a pulley supporting a belt which is strained by its own weight in the direction of the parallel and equal lines *OB* and *NC*. Let these lines represent in lengths the amount of the respective strains. Then the resulting pressure of the belt on the surface of the pulley may be represented by a line *SCB* equal to the sum of *OB* and *NC*. This is the case when the pulley is at rest. If *OB* is greater than *NC*, the pulley will be turned toward *B* with a force, equal to *OB″ —NC*, for a certain portion of *OB′* must be used up in counterbalancing *NC*. Now the strain *OB″—NC*, or *BB″* can produce no pressure on the surface of the pulley, for the simple reason that there is no force to resist it except the friction of the belt on the pulley; and whenever there is a pressure there must be an equivalent resistance. Here, then, is no resistance except friction; the pulley will probably turn, or the belt will slip; if neither occurs, then the tension *BB′* is not equal to the frictional resistance. So that this "pull in one direction," as Mr. Rose calls it, is a factor of the driving power, independent of the friction, and therefore independent of the arc of contact. Let us, therefore, consider the arc of contact as dependent only on the tension of the belt when at rest, so far as it [the arc of contact,] is a factor of the driving power.



MITRE ATTACHMENT.

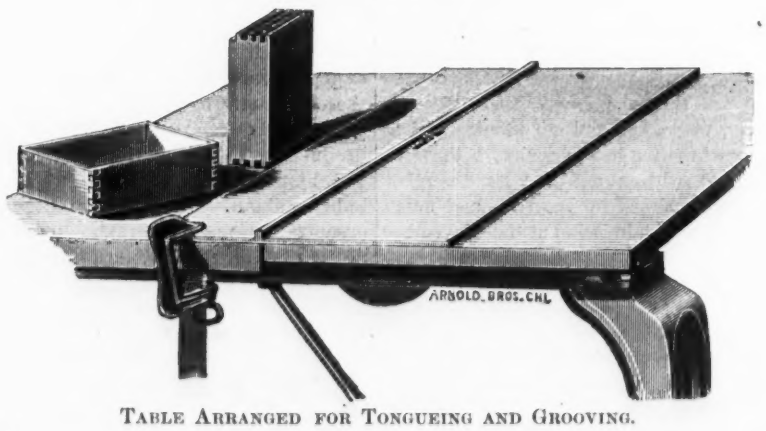
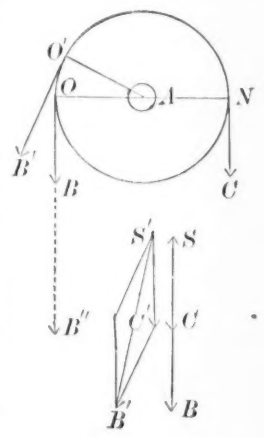


TABLE ARRANGED FOR TONGUEING AND GROOVING.

If *OB* and *NC* are not parallel, but, make with each other an angle *BOB′*, the resultant pressure on the pulley can be graphically represented only by a line forming the diagonal of the parallelogram of forces *S′B′*, whose sides are equal to the lines *NC* and *O′B′* in length and direction. Without going into trigonometry, it is easily seen that this line *S′B′* is shorter than *SB*, and that accordingly the resulting pressure must be less, when the two sides of the belt make an angle, than when they are parallel, and will continue to decrease as the angle increases. But as the angle *BOB′* increases from 0° to 180°, the arc of contact decreases from 180° to 0°, for the one is the supplement of the other, as will be seen by studying the diagram. Hence, if the pressure is dependent on the angle *BOB′*, it is also dependent on the arc of contact. But the friction is dependent on the pressure, hence the friction is dependent on the arc of contact. But the driving power varies as the friction, therefore in short, *the driving power varies with the arc of contact.* Let me now try and satisfy Mr. Rose that this reason does not apply at all to the *area* of contact. Thus far you will notice that nothing has been said of the width of the belt. It has been a question of the resolution of forces simply, and not a question of areas. Our belt may be infinitely narrow, and the demonstration be just as complete; in which case increasing the arc of contact does not increase the area, for the area is but a line. If this demonstration is good for an infinitely narrow belt, it must be equally good for each one of an infinite number of infinitely narrow belts, running side by side at the same speed over the same pair of pulleys, and therefore true of the whole, which amounts to the same thing as a belt of so many inches in width. Don't it? This reasoning is rather fine, I confess, but none the less sound, and just as comprehensible as Mr. Rose's spherical pulley of infinite diameter. In short, this reason why increasing the *arc of contact* increases the driving power of a belt does not in the least apply to any change of *area of contact.* Let me call Mr. Rose's attention to the wire rope belt which is a striking practical example of the truth I have tried to make evident. Here the area of contact is always so small that its effect on the friction, if it has any, is not considered in the calculations of engineers, while its arc of contact is an important factor in its driving power according to the mathematical principle here shown. The same is true of all belts of whatever material or whatever sectional shape.



FREDERIC H. LANE, M. E.

WARREN, Me.

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AMERICAN MACHINIST

PUBLISHED WEEKLY

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☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, SEPTEMBER 18, 1880.

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Progress of the New Engineers' Society.

On another page we publish the full list of officers and membership of the American Society of Mechanical Engineers, as it appears in the forthcoming catalogue of the Society. Considering the numerical strength and mechanical standing of the persons already enrolled, this is a most promising beginning for the new organization.

As the pioneer society of its kind in this country, the great success of the corresponding organization existing in England, illustrates forcibly the proportions which this body may in time hope to attain. The term "mechanical engineer," as it is understood in Europe, hitherto has not conveyed its full significance in this country, having been mainly confined to consulting or constructing engineers who maintain an office and do a clientage business.

One of the ablest and most successful engineers in this country, in speaking of this new organization, of which he is a prominent member, illustrated this fact forcibly, recently, by the remark that he had never yet, in all his business career, written the initials "M.E." after his name, nor called himself a mechanical engineer, his highest ambition having been to be a "pump maker." In England, modesty of this sort would be as unavailing as it is creditable, as there the fullest recognition is given to engineering ability, however varied its functions. In one of his recent letters, our correspondent Chordal, significantly says, in substance, that a good foreman is more often a bad workman, for the reason that great general ability is seldom compatible with the skill in minor details that comes from close attention and long practice. In like manner, the directing head of a great engineering or manufacturing establishment, whose mind is more accustomed to grasp the general ideas of mechanical construction, than the niceties of detail which are habitual with the professional engineer, cannot, in any proper sense, be denied the title of mechanical engineer.

In his opening address at the meeting preliminary to the organization of this Society, which was held at the office of the AMERICAN MACHINIST, February 16th last, Mr. A. L. Holley admirably sketched the extent of the field covered by the term "mechanical engineering." Naturally, the many branches into which engineering operations and processes divide themselves in practice, to a similar extent diversify the mechanical gifts which any one man is reasonably likely to possess. The engineer who is skillful in the mixing of metals, in blast furnace operations or foundry processes, might be the last person to whom one would apply who had in view the designing or construction of a new locomotive or machine tool. The engineer whose study has been mainly given to marine architecture, or to the designing and construction of grain elevators, occupies a field totally distinct from the originator of a steam engine, the military engineer, the superintendent of a stamp or rolling mill, the inventor of accepted mechanical appliances for any useful purpose in mechanics, or the instructor whose task it is to grapple theory fast to practice by hooks of thought—yet all are essential parts of a mighty whole, whose scope is almost as broad and as deep as that of the human mind itself. The wisdom of the projectors of the new American organization in building upon foundations of this practical sort, will become more and more manifest as the Society grows older, and impresses itself more and more upon the actual mechanical work of the country and time.

As yet, we understand no blank applications for admission to the Society have been printed; but, without doubt, a large number of applications will be received and acted upon in time for admission at the November meeting.

So far, the working expenses of the new Society have been very small; the appointment of a permanent Secretary and the publication of the valuable papers, which will doubtless be read at the first regular meeting in November, will find the financial affairs of the organization in the best of shape. We are informed that the Treasurer has in bank, belonging to the Society, funds to the amount of $2,500, derived wholly from initiation fees, a fact of the highest promise for the future of the Society, and the feeling which underlies it. Indications are many that this feeling will manifest itself, not only in the continued growth and prosperity of the Society, but also in the practical results, whose roots take hold in the home life and higher development of the workmen, in whose active minds the seeds of so many great mechanical improvements have ripened into practical form.

In commenting upon the promising beginning of this great movement, we will venture to repeat the suggestion made by us after the meeting for final organization, that the memorable services rendered by Prof. John E. Sweet, in taking the initial steps that have led to the present admirable results, and his exceeding modesty in declining to be, for the present, other than a private member of the Society, entitle him to the honor of being invited to read the first paper that is laid before it. In so doing, the organization will honor itself, as well as the recipient of its compliment.

There is a wide complaint of the lack of good machinists among the shops of New England. All the best workmen seem to be employed steadily, and the offer of high wages does not induce many first-class machinists to apply for work.

Assailing Our Manufacturing Industries.

We have received a 30 page pamphlet, entitled "The Western Farmer in America," by Augustus Mongredien, published for the Cobden Club of England. The author has undertaken, under auspices of this free trade organization, to convince our farmers (by which term he means producers of all articles derived from the cultivation of the soil) of the iniquities of our protective tariff. He labors to show that millions of dollars are annually expended for manufactured goods in this country over and above what the same would cost if imported from England without paying any duty. But, unlike some free trade apostles, he does not dwell upon the enormous profits of the American manufacturer, as may be seen by the following extract:

"The profits of the Eastern manufacturer are precarious, fluctuating, and by no means above the average of other occupations. His charge of $140 for what the Britisher can afford to sell for $100, only leaves him a bare living profit, because it costs him $40 more to produce the article than it costs the Britisher. Why this should be the case we cannot here stay to inquire, but such is the fact"

It is very easy to explain what the author "cannot stay to enquire." The reason that some American made goods cost more to produce than do the same in England, is that mechanics and skilled workmen of every class are paid higher wages here than in Europe. If the Cobden Club were able to influence a reversion of our national legislation, so as to repeal our protective tariff, they might see American workmen reduced to the same tooth and nail struggle for a meagre subsistence as foreign workmen.

The Western farmers who are enabled to sell more and more of their products every succeeding year, for consumption in manufacturing cities and villages near at home, at good prices, will probably object to seeing those industrial establishments closed, and themselves obliged to sell all their surplus produce to speculators, for shipping abroad. Yet this is what the Cobden Club is aiming to bring about. But why should this British organization manifest such interest in the prosperity of the Western farmers, as to print and circulate pamphlets to point out to them the evils of protection? It would be hard to convince the farmers of the West, that pure philanthropy is the leading motive, especially as British manufacturers are striving to regain a lucrative trade in supplying our markets, which they see slipping away from them through the building up of domestic manufactures. The only way they find to reverse this condition of business, is to break down the protection barriers. The pamphlet closes with the following touching appeal:

Meanwhile, all honor, Western farmers of America, to the brave and blessed work which your indomitable energy and brawny arms are accomplishing! While in Europe millions of able-bodied men are dragged from the plough and the loom to be trained to bloodshed and destruction, you are pursuing your beneficent conquests over nature, and converting barren wastes into orchards and cornfields. Surely the least that you can demand in return is that your earnings should not be wrung from you by unjust laws, and that you should be allowed to enjoy undividedly the fruits of your unremitting toil.

It is for you to decide, and to enforce your decision.

And the farmers are intelligent enough to decide to help themselves, in preference to British manufacturers, and to oppose a direct tax for the support of the National Government, which would, of necessity, replace the discarded tariff.

A Newspaper Mis-Directory.

Some weeks ago, we received from Geo. P. Rowell & Co., advertising agents, of this city, a copy of their new "American Newspaper Directory," with a request that we examine the same and publish our opinion of its merits. We have given the book a careful examination, and regret that we cannot commend it more than to say that it is well printed and neatly bound. Of its 1,044 pages, 513 are devoted solidly to advertisements *almost wholly of newspapers*, while a pretty fair sprinkling of advertisements appears throughout the remainder of the volume. The object of its publication is, therefore, palpable. Whether the large amount of labor, expended in securing these advertisements, has so encroached upon the time set apart for preparing the directory as to prevent its being properly compiled or not, we have no means of knowing, but the result before us is the lamest apology for a full newspaper directory we have ever seen.

Even a cursory perusal of its pages will reveal the fact that many widely circulated papers, which have been regularly published during periods ranging from two to ten years, or more, are omitted altogether, while a goodly number of defunct papers are credited as still in existence. In rating the circulation of papers, either guesses, or wanton misrepresentations, have been practiced. It needs but a reading of the preface and a glance over a few pages of the book to convince any candid observer of this fact. The publishers explain that they have much difficulty in persuading newspaper proprietors to give the figures of their circulation, and name some that flatly refuse to do so, yet the circulations of those same papers are put down in the directory with as much assurance as that of others who do not refuse the information. Business men, who believe that Rowell & Co. have superior facilities for guessing at the circulation of newspapers, without advices from either the publishers of the same or the news companies (who are firm in refusing such information), may possibly consult their book as authority on the subject. As examples of how their plan is carried out, we notice that the *Polytechnic Review*, which suspended over two years before the directory was published, is listed as still in existence, and credited with a very fair circulation, while *McGee's Illustrated Weekly*, which had been defunct for some time, is given a circulation of over 15,000 copies! It will doubless be amusing to our political friends, who may desire to use a newspaper directory for campaign purposes, to see some of the papers listed as adhering to one of the political parties, and, upon turning to their advertisements, to find the announcement that they adhere unflinchingly to a rival party, as well as to see avowedly partisan sheets accredited as "independent."

One of our city exchanges, whose first issue

bears date of Jan. 1, 1878, is put down "established 1877." Whether the full page advertisement, occupied by that paper, entitles it to be considered a year older than other journals starting at the same time, we have no means of knowing, for the ways of Messrs. Rowell & Co. are very misty.

Although the circulation of the AMERICAN MACHINIST is grossly misrepresented, we are unconscious of sustaining any damage, for it is well known that anyone who desires may obtain full information of its circulation from us at any time. In answer to their inquiry, we informed Rowell & Co. that our circulation was, at that time, 10,000 copies a week. We also declined an urgent solicitation to advertise in their directory. Whatever there is in the moral make up of that firm, which apparently makes it impossible for them to credit the plain statement of fact given them by us (which could easily have been substantiated), we are unadvised—possibly the following extract from the *New York Tribune* of Aug. 4, may supply this missing clue:

Intending advertisers will do well to beware of the specious promises held out in an address to them in another column by Geo. P. Rowell & Co. Instead of being an authority, as pretended, on "the leading newspapers," their chief business is with the "patent insides," and their main interest is to discourage advertising with the best papers, where they can only make a legitimate commission, in order to encourage it with the wild-cats, on which they can make almost any share of the bill they choose to exact. We believe them to be an unsafe and untrustworthy house. Their business, once quite good, has heavily declined, and they have been forced to take less expensive quarters, and greatly reduce their clerical force—largely, we think, because the public have found them out. We have ourselves more than once detected them in representations which were either discreditably ignorant, or impudently false; and they have been successively denounced by *The New York Herald*, *The New York Times*, *The New York Evening Post*, *The Chicago Inter-Ocean*, and a large number of similar papers in the leading cities of the country. When it comes to advertising their own business, however, they know where to go, and, in spite of our telling the unpalatable truth about them, they regularly seek the columns of *The Tribune*.

We are in receipt of the second number of the *Journal of the United States Association of Charcoal Iron Workers*, a 48-paged quarterly magazine, edited by the Secretary, John Birkinbine, and printed by Lane S. Hart, Harrisburg, Pa.

It is the official organ of the Association, and is sustained by their funds. The first number was issued in April, and contains the minutes of the preliminary and first regular meeting of the Association, besides articles on charcoal, coke, anthracite, charcoal-iron, and other matters pertaining to their specialty. The August number contains some statistics of the charcoal and iron trade, with illustrations, and, among others, an article on Tin Plate, and one on Forests of Washington Territory.

Lately, we have received so many letters on belting that we must ask our correspondents to make their communications on this subject very brief and pointed.

On page 5 will be found the first part of an interesting and instructive article on the Elementary Principles of the Steam Engine, by the well-known engineer, Charles E. Emery, of this city. This article will be completed in our next issue.

The New York, Lackawanna & Western Railroad Co. has decided to begin the building of a line from Binghampton to Buffalo at once. The principal places through which the line will run will be Elmira and Dansville, the main line connecting at that point to Buffalo, with a branch line from Dansville to Rochester. The following officers were elected for the ensuing year: Samuel Sloan, President; F. F. Chambers, Secretary; F. H. Gibbons, Treasurer; A. D. Chambers, Assistant Treasurer. The Executive Committee will consist of Samuel Sloan, Percy P. Pyne, B. G. Clark, George Bliss, Jay Gould, Russell Sage, and Solon Humphreys.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) W. B. K., Waynesboro, Penna., asks: Will you please inform me how I can re-polish German silver (as, for instance, a cornet) that has become tarnished by perspiration from handling, but which cannot be removed by whiting? The cornet has not been in use more than one year. *A.* Make a thin paste of the following ingredients: Alcohol, 2 parts; ammonia, 1 part, and whiting enough to make a liquid like cream. This should be applied to the metal with a piece of chamois skin, and allowed to dry. The surface should then be polished by applying a very fine brush. Alcohol and lamp-black are also used in cleaning silver with very good success, as, for instance, upon the reflectors of locomotive headlights. The lamp-black must be perfectly free from all grit.

(2) H. L. H., Atlanta, Ga., asks: Will you please decide the following question:—We have a steam drum stayed by a rod connected to both heads. The boiler maker cut it in the middle, riveting the cut ends to the shell. He claims, while connected to both heads the rod had twice as much strain as one piece now has, connected to the shell and one head. I say the strain at first is the same as the strain on one part now. Who is right? *A.* There is no difference in the strain upon the rod, whether it be single and connected to both heads of the boiler, or cut in the middle and attached to the shell at some intermediate position. It is simply the old philosophical question revived, viz., Which will produce the greatest strain upon a rope, by attaching one end to a post and a pair of horses to the other, or hitching a pair of horses to each end, each pair of horses to pull the same in both cases? There can be no difference.

(3) J. E. L. B., South Berwick, Me., asks: Can steam be made as economically from water condensed from the exhaust steam of an engine as from water that had not been run through the boiler, both entering the boiler at 200° temperature? *A.* Steam can be generated most economically from pure water. The impurities found in water retard evaporation and cause a deposit in the boiler. When the condensation from exhaust steam from the cylinder of an engine is used to feed the boiler, precautions should be taken to remove the grease and not allow it to pass into the boiler, for obvious reasons.

(4) S. B. W., Worcester, Mass., asks: Please inform me how is the best way to get a job to run an engine. I am a young engineer and would like to get a situation to fire for some first-class engineer and work myself up? *A.* We are constantly receiving similar letters, inquiries from young men, and feel interested in them, as we were once similarly situated. The best advice we can give is contained in the latter part of our answer to question (5) in our issue of Sept. 4, 1880.

(5) W. B., Sing Sing, N. Y., writes: It is my desire to become a mechanical draughtsman. I have had two and a half years' practice at the machinist trade. One year was as assistant engineer. I was brought up in and about a foundry, having worked two months on a floor of my own, making castings for general jobbing and for plumbers. You will see that I have had quite a little experience in the mechanical arts. Will this be of any assistance to me? Are there any free schools that teach mechanical drawing? If not, of whom would you recommend me to study? What is your opinion of the profession? *A.* The most economical method of becoming a mechanical draughtsman that we know of, is to make an early application for admission to the free class in mechanical drawing which is held every winter in the Cooper Institute, in this city. In your case it would be necessary for you to get employment in the city, working in the day time and attend school during the evening. All the expense incurred at the Institute is in furnishing your books and instruments which you may obtain at the trade price from the instructors. Our opinion of the profession of a mechanical draughtsman is a very good one, and if you have not mistaken your calling, and are persevering you will not be disappointed in adopting the same as a means of obtaining a livelihood.

(6) W., Boston, Mass., writes: I have a shaft running 150 revolutions per minute, and wish to transmit ten horse power to another shaft 24″ from center to center and parallel with first shaft. Speed of the second shaft is to be 150 revolutions. I cannot use gears, even with wooden teeth, as they are objectionable on account of the noise. Is there a V-shaped belt that would do the work running over, say, 20″ grooved pulley? What would you recommend? *A.* The power may be transmitted by placing a pulley of 22″ diameter upon each shaft and in line with each other; a belt should be placed upon them which has several feet of slack hanging below the shaft, the upper part of which should run under a stationary pulley of about 10″ diameter, while the lower part should run under a pulley with journals designed to move in guides and a sufficient weight attached to prevent the belt from slipping. The plan is good and easily arranged. The belt may also be run above the shaft or at an angle, instead of below, as desired, to economize space. The transmission may be made another way, by belting from each line shaft to a countershaft. This plan is very good, and in some cases may be preferable to the other, although more expensive.

Business Specials.

40 cts. a line for each insertion under this head.

Thomas D. Stetson, Patent Solicitor and Expert in Patent Cases. No. 23 Murray St., New York.

Wilkinson & Crowell, No. 506 Walnut St., Philadelphia. "Paragon" Piston-rod Packing, entirely metallic, automatic, frictionless, and practically free of steam pressure. Will work on high-speed or condensing Engines.

John A. Caldwell, Mechanical Engineer, 94 Liberty Street, New York.

Blowers for all purposes. Exeter Machine Works, 50 Federal Street, Boston.

American Watch Tool Co., Waltham, Mass., Whitcomb Watch Makers' Lathes, and Watch Machinery.

See Standard Turbine advertisement in last issue.

A 4½ in. 2 Jaw Chuck, Independent or Universal for Brass Work. A. F. Cushman, Hartford, Conn.

Drop Hammers. Stiles & Parker Press Co., Middletown, Conn.

All makes and sizes of Steam Hammers bored out. L. B. Flanders Machine Works, Philadelphia, Pa.

Paper Making Machinery—Makers of above from fibrous material as wood, esparto grass, etc., send address to Joshua Rose, P. O. Box 3306, N. Y. City.

Engines, Hoisting and Pumping Machinery for Mines. The Band Friction Hoist, which is the safest, simplest, strongest and best in the market. Also, Friction Clutches. Address, Webster Camp & Lane Machine Co., Akron, O.

Rules for Engineers, and Removal of Scale in Boilers. Send for Circular. Ranken Scale Co., 50 Federal Street, Boston.

Dixon's Traction Belt Grease. Dixon's Founders' Perfect Wash. Dixon's Plumbago Foundry Facing. Dixon's Graphite Machine Grease. Dixon's Everlasting Graphite Axle Grease. Dixon's Dry American Graphite Perfect Lubricator. Send for explanatory circular to Dixon Crucible Co., Jersey City, N. J.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, D. Appleton & Co, New York, or the author, Manchester, N. H.

Sheet Metal Presses. Ferracute Co., Bridgeton, N.J.

Engines Indicated—Power Measured. W. H. Odell, Box 274, Yonkers, N. Y.

John Douglass, common and fine patterns made to order, also car wheels, working models, and experimental machinery. Shop at Washburn, Hunts and Co's Wheel Foundry, cor. Warren and Bay Sts., Jersey City, N. J.

MANUFACTURES.

The Seth Thomas Clock Company, of Thomaston, Conn., have purchased a 125 horse-power Babcock & Wilcox boiler, which will be set up with the Jarvis Furnace to burn screenings without a blower.

The big locomotive, built for the Reading Railroad, to run a mile a minute between Philadelphia and New York, and which nearly accomplished the work on a trial trip last May, has been sold to Russia, and is now on its passage across the ocean.

Daniel Cushing & Co., of Lowell, Mass., are making an iron tower for the Court House in Montpelier, Vt. It is 15 feet square and 40 feet high. They have also made all the galvanized iron cornice work for the building. They are doing the galvanized iron work for the new Opera House, at Manchester, N.H.

A carriage manufacturing concern, with $100,000 capital, has been incorporated at Hornellsville, N.Y.

George Draper & Son, of Milford, Mass., the well-known machinery manufacturers, contemplate building a $100,000 cotton mill.

The Hamilton Manufacturing Company, of Lowell, are putting in wheel-pits for two turbine wheels, each of 250 horse-power, to be used in running their new mill, the foundation of which is already laid. An engine of one thousand horse-power is also to be put in for future use. The company have added six new boilers, each of 100 horse-power, this year.

W. H. Pierce, of Sprague, Conn., contemplates building this Fall, at Columbia, S.C., a twenty thousand spindle cotton warp mill.

The Aldermen of Cambridge, Mass., have appropriated $20,000 to connect their water system with Boston's supply, and $5,000 for repairs and improvements at Fresh Pond.

The Altoona Fire Clay Company will soon begin to operate their works, employing one hundred men. The clay is mixed at Bennington, in the Allegheny Mountains, where an inclined plane has been constructed and a stationary engine located. The clay is dropped down into the cars below on a side track, which latter connects with the main track of the Pennsylvania Railroad, and is brought directly to the works over the main line and Hollidaysburg branch road.

The Rubber Cushioned Wheel Company, of Cincinnati, O., are now making extensive preparations to manufacture a wheel with a metallic hub, into which rubber is introduced for the sake of giving elasticity, and for muffling noise and vibrations.

The Geo. F. Blake Manufacturing Co., of New York and Boston, are engaged in building a duplex pumping engine, of a daily capacity of 2,500,000 gallons, for the city of La Crosse, Wis. They have also under contract a pair of pumping engines with a combined capacity of 1,500,000 gallons daily, for the new waterworks now being built at Stillwater, Minn.

The Chicago, Burlington & Quincy Railroad has completed an arrangement for the erection of a large elevator on its property in East St. Louis, with a capacity of three-quarters of a million bushels.

Stacy B. Hart & Co., is the name of a new firm at Peoria, Ill., engaged in the manufacture of grain drills.

A new ice factory is nearly completed at Jackson, Miss.

A fish-canning factory is to be established at Pascagoula, Miss.

The Clarksville Paper Company, of Clarksville, Pike County, Mo., has been incorporated with a capital of $15,000. The company will build mills, and engage in the manufacture of paper.

Henry Carrier, T. Earle, and R. R. Asbury have organized a terra cotta company in Greenville, S.C. They are to manufacture carbonated stone pipes for various purposes.

Mechanic Falls, Me., has a new corn canning establishment.

The Johnson M'f'g Co., North Adams, Mass., have been making extensive additions to their works.

The Lockwood Company, of Waterville, Me., have ordered their boilers to be set with Jarvis Furnaces. They have been testing all kinds of waste fuel, such as wet slabs, sawdust, etc., and the result is so satisfactory that Mr. A. D. Lockwood will also set his boilers at Danielsonville, Conn., in this way.

The North Adams Manufacturing Company, North Adams, are making an addition to their power in the shape of a 140 horse-power Buckeye engine.

The Stark Co., at Manchester, N. H., contemplate making additions to their works in the way of new buildings and more machinery.

The Springfield, (Mass.), Foundry Co. are making additions to their shops, 20 by 30 feet, three stories high.

Barney & Berry, Springfield, Mass., have been building an addition to their skate factory 100 by 189 feet, three stories high.

The New England Can Co., Springfield, Mass., are putting up an addition to their buildings for the Gleneida Button Co.

S. B. Lowe has erected extensive works at Chattanooga, Tenn., for the manufacture of mineral paints from the native Southern ores. The machinery is of the most approved and modern make, and has a capacity of from 5 to 7 tons per day.

M. E. Weiss, at a session of a foreign industrial society, advanced the curious idea that the corrosion of steam boilers is due to the action of ozone, which he thinks is generated by electrical action, resulting from the violent impulse of steam against the upper portion of the boiler.

The St. Paul and Pacific elevator, at Minneapolis, has been seriously damaged by a peculiar worm that perforates the boards and lets the wheat down as if running through a sieve.

A Corliss engine of 250 horse-power is to be procured to furnish power for the new flouring mill at Anoka, Minn., the water-power having proved insufficient.

In order to guard against stoppages from lack of water, the Whitinsville Manufacturing Company, Whitinsville, Mass., has ordered an engine of 100 horse-power, which will soon be placed in their factory.

In accordance with the annual custom, the water will be drawn from the Cohoes Water Power Company's canals, thus enabling the making of necessary repairs to water wheels and other machinery, and allowing the hands a brief respite from work.

Richard Dobbins, boiler manufacturer, Lowell, has recently filled orders for the Lawrence Co., Lowell, for fourteen 80 horse-power tubular boilers, also for the Boston Manufacturing Co., Waltham, Mass., one nest of Corliss boilers, 400 horse-power. He is also making 3 nests of Corliss boilers for the Merrimac Manufacturing Company, of 400 horse-power each, and for the Merrimac Manufacturing Company, a steam pipe 20 inches diameter, 462 feet long, and a steam pipe 15 inches in diameter, 528 feet long.

C. B. Dickinson, proprietor of the rubber works at Brooklyn, N.Y., has visited Holyoke with a view of establishing his works in a mill of the Water Power Company.

The Pittsfield, Mass., Overall Company has organized with John S. Wolfe as president and treasurer, George Pease, secretary, and C. N. Drowne, manager.

Connor Bros., of Holyoke, Mass., who employ about 100 hands at their shoddy mill, are to add new machinery to increase their production, and are running part of their works overtime.

The contract for the new ten-million gallon engine for the use of the Fairmount Water Works, Philadelphia, Pa., has been given to Henry R. Worthington, of New York.

Another water company has been organized in Quincy, Ill., called "The Citizens Water Company of Quincy." Capital stock, $200,000. The organizers are: M. Goodman, R. W. Gardner, and others.

Over one hundred business men of Lynn, Mass, have signed a petition to the Board of Alderman for them to allow the new Citizens' Gas and Steam Company to lay gas-pipes through the public streets. The new company thinks it can furnish gas at $2 per thousand feet; the present company's rate is $3. The first named company already has permission to lay steam-pipes.

There is a complaint of lack of good mechanics in the carriage factories of the West. Good wages are offered, but the supply is not equal to the demand.

The Buckeye works, Canton, O., will not shut down this season. This firm will manufacture 2,000 more mowers and reapers this year than last. Their new thresher is an assured success.

The Co-operative Foundry Association at Beaver Falls, Pa., are very busy. They did $5,000 more business in July than ever before in that month, and are working now exclusively on heaters.

The Co-operative Flint Glass Co., Beaver Falls, Pa., organized a year ago last June, is a success. One hundred and ten men and boys are employed constantly, and the furnace is operated to its utmost capacity. The company make both pressed and blown ware, including table sets, lantern globes, druggists' ware, druggists' labels, etc. They also make convex glass for photographs, lamps, and are adding new novelties monthly. The stockholders, to a large extent, are the employees, and were originally from Pittsburgh. —*National Labor Tribune.*

The Secretary of State has just licensed the Washington Heights Pullman Horse and Dummy Railway Company, of Chicago. The object of the company is to operate a line between Washington Heights and the village of Pullman in Hyde Park. The incorporators are Samuel Parmley, Xavier L. Otis, and others.

A new steel mill is to be located at Pitts burgh, by A. Kloman & Son, of the Superior Mill, Alleghany. The main building will be 684 feet long, with two wings, 60 by 120 feet, and a rear wing of 120 feet square. The mill will consist of 21 inch rail train, a 16 inch bar train, a muck train, and two Universal mills for rolling special shapes. Its capacity is estimated at 50,000 tons of steel rails annually, and 30,000 tons of structural material, principally steel.

Hornellsville, N. Y., has a new carriage manufactory with $100,000 capital.

The Philadelphia Steel Forge Company have made one of the largest ingots of crucible steel ever cast in this country. It weighed upward of 900 pounds, and was in perfect condition. The company report plenty of orders on the books.

The I. P. Morris Company, Philadelphia, are shipping a large blowing engine to the Colorado Coal and Iron Company, Pueblo, Col.

The iron steamship, City of Augusta, built at Roach's shipyard, Chester Pa., for the Ocean Steamship Company, was successfully launched on the 11th ult. Her length is 321 feet; beam, 40½ feet; depth of hold, 35 feet, and 2,000 tons burden.

Machinists' and Engineers' Supplies.

NEW YORK, September 2, 1880.

The Autumn opens very favorably for the trade Prices are strong enough to give confidence to buyers, and inspire sellers with more than usual hopefulness. With manufacturing establishments everywhere busy, and railroads rapidly extending, the outlook can hardly fail to be gratifying. Boiler tubes are now selling at 40% discount from list, which is an advance. Nails have been advanced to $3.25 per keg. H. Prentiss & Co., 14 Dey Street, New York, have just issued the following price list (per dozen) of Deverell's New Perfection Oiler:

Sewing Machine Oiler, glass, $1.75; zinc, $2.00. Spring Bottom Bench Oiler, zinc, $3.00; brass, $5.50. No. 0, Cotton Mill Can, zinc, $3.00. No. 1, Engineers' Can, Flaring, zinc, $4.20; brass, $12.00. No. 2, Engineers' Can, Flaring, zinc, $5.40; brass, $13.50. No. 3, Engineers' Can, Flaring, zinc, $6.00; brass, $15.00. The above numbers in Zinc Straight cost 10% less. Nos. 1, 2 and 3 in Copper (Straight) cost same as Brass Flaring. No. 1 holds 1 pint; No. 2, 1½ pints; No. 3, 2 pints, in all metals, and have spouts 7½ inches long. Longer spouts cost (per dozen) as follows:

ENGINE CAN SPOUTS.

7½ inches long	Brass,	$2.50;	tin, $1.40
10 " "	"	3.00;	" 2.00
15 " "	"	3.40;	" 2.25
18 " "	"	3.60;	" 2.40

Liberal discount to the trade.

Iron Review.

NEW YORK, Sept. 2, 1880.

The demand continues good for all kinds of Iron and Steel. The sale of steel rails the past few weeks have been enormous, and the number of miles of new railroads under contract unprecedently large, this keeps our mills busy, as the demand for all railroad material must be proportionately great. Prices are about the same as last reported, but the tendency seems to be to hardening of prices all round.

Pierson & Co., 24 Broadway, N. Y., under date of Sept. 2, 1880, quote prices out of store as follows:

Iron Rails, $50 to $57, according to weight; Fish Plates, 2¾c. per lb.; Railway Spikes, 3¼c.; Bolts and Nuts, 3¼c.; Common Bar Iron, 2.4c., basis from store; Refined do. 2.6c., basis; Ulster, 3.6-10c. basis; Machinery Steel, 6½c.; Best Tool Steel, 13½c.; Norway Bar Iron, 6¼c.; Norway Shapes, 6¾c; Nail Rods, 6¾c.; Sheet Iron, 3½c., basis; Angle Iron, 3¼c.; Tee Iron, 3¾c.; Band Iron, 3.4c.; Hoop Iron, 3.6c., and up according to size; Horse Shoe Iron, 3.5c.; Hot Polished Shafting in lengths, 2 ft. and longer, 9 to 10½c., according to size; Small Black Rivets, 30% off in papers; 10% off in bulk.

Carmichael & Emmens, 130 Cedar St., New York, quote prices of Boiler Makers' Supplies from store as follows:

Flange Iron	5½
C. H., No. 1, Shell Iron	4½
C. No. 1 Iron	4¼
Tank Iron	4
Sheet Iron	3¾
Angle Iron	3½

Boiler Tubes at 40 per cent. discount off list.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling Slip, New York, furnish us the following, under date of Sept. 2, 1880:

No large transactions have taken place in metals in this market during past week—business confined to jobbing, with a fair demand. Pig Tin has been very active in London and price declined to £87. Singapore, $27½. We quote this market, nominally: Banca Tin, 23c; Malacca and Straits, 21c to 21¼c; Australian and Billiton, 20½c. to 20¾; English Refined and "Lamb and Flag," 20½c. to 20¾c.; Pig Lead, 5½c. to 5¼c.; Antimony, 17c. to 16c., according to brand; Spelter, "Bertha," pure, 8½c.; Western 5½c.; Silesian, 6c. Solder, No. 1, 11¾c., "Half and Half," 13¾c.; Bismuth, $2.50 to $3.00.

WANTED.

An experienced machinery iron works Superintendent wishes to engage with reliable parties. Address, P. H. L, care AMERICAN MACHINIST office.

A Practical Machinist and Engineer, having many years experience as draughtsman and foreman, desires a situation in a shop or mill. Address, Cold Chisel, AMERICAN MACHINIST office.

A machinist wants a situation; experienced in building French Wire Nail Machines and manufacturing all kinds of wire nails. Address K. C., care AMERICAN MACHINIST, 96 Fulton St., New York.

FOR SALE.

A Works completely equipped for the manufacturing of carriage axles; is well located in relation to Coal and Iron, also very accessible to market. Address

E. P. BULLARD,

14 Dey Street, New York.

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Send 10 cents for 96 page Catalogue of Books for Machinists and Engineers.

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Headquarters for Machinists' Tools and Supplies.

CHAMPLIN & SPENCER,

154 East Lake Street, - Chicago, Ill.

Sole agents for the "Tanite" Emery Wheels and Grinding Machinery. Dealers in Screw Cutting Lathes from $50 to $150, with foot power, Small Amateur Lathes, Taps and Dies, "Twist Drills," Machine Screws, "Grobet Swiss Files," Machine Bits, Stubs' Steel Wire, Brown & Sharpe Tools, Emery, Crocus and Composition, Rouge, Drop Forged Lathe, Clamp and Die Dogs, Chucks, Wrenches, Hand and Bench Vises, Iron Levels, Metal Saws, Pattern Letters, Pliers, Calipers, Slide Rests, Steel Rules, Micrometer Calipers, Speed Indicators, "Metallic Corrugated Packing" for steam, air, gas or water joints, Steeline for hardening purposes, Upright and Hand Drills, Belting and Packing, Walrus Wheels, "Monk's Moulders' Tools," &c., &c

STEPHENS' PATENT PARALLEL VISE and attachments, adapted to every variety of work from Jewelers' to Locomotive Shops. It opens **further**, holds **firmer**, is **heavier** and more **durable** than any other vise. For sale by the trade.

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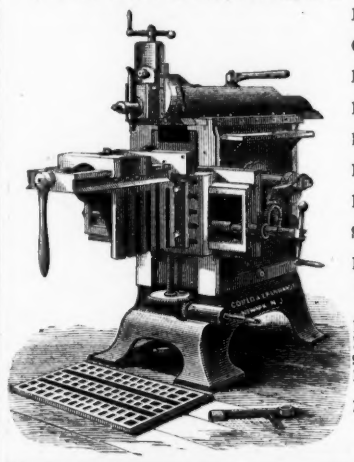
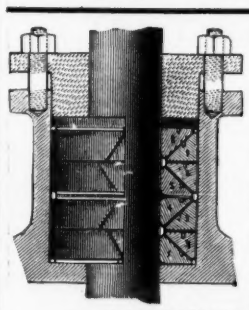
Manufacturer of ENGINE LATHES from 16 to 48 in. swing. Cuts, Photographs and Prices furnished on application. LOWELL, MASS., U. S. A.

E. GOULD & EBERHARDT,

97 to 113 N. J. R. R. Ave., Newark, N. J.

Builders of Lathes, Shapers, Planers, Drills, Bolt Cutters, Gear Cutters, Power Presses, Drawing Presses, Drop Presses, Foot Presses, Lever Presses, Screw Presses, Bank Note Printing Presses, Mortising Machines, Special Machinery and Machine Work in General.





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For full particulars and references address

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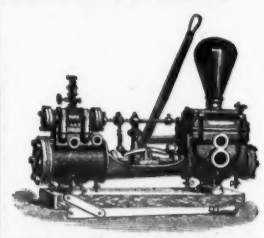

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1st.—It is perfectly straight and round.

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3d.—It has the beautiful blue finish of Russia Sheet Iron, rendering it less liable to rust or tarnish than shafting of the ordinary finish.

4th.—It will NOT SPRING OR WARP IN KEY SEATING like most of the other manufactured shafting sold in the market, and, as a consequence, is admirably adapted for LINE AND COUNTER SHAFTING.

5th.—The surface is composed of MAGNETIC OXIDE OF IRON, forming a superior journal or bearing surface.

6th.—It is made of superior stock.

Price lists, with references and other information, furnished on application to us.

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General Agent for N. Y. City and other Eastern States.

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"Double Ender" Saw Files.
"Slim" Saw Files.
"Racer" Horse Rasps.
Handled Rifflers.
Machinists' Scrapers.
File Brushes, File Cards.
Surface File Holders.
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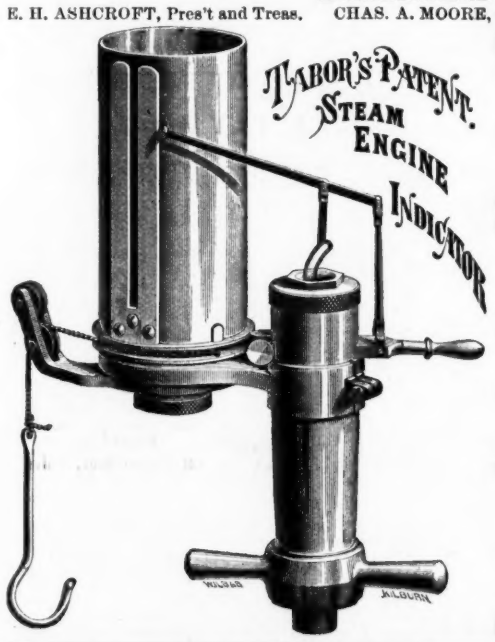

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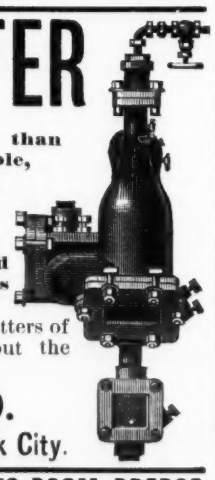

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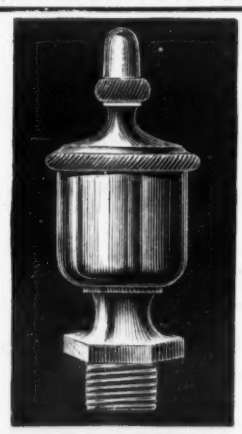

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No. 1—1¼ in. diameter, 2¼ in. high. Threaded for ¼ in. Pipe Tap. **Per Dozen, $2.50.**

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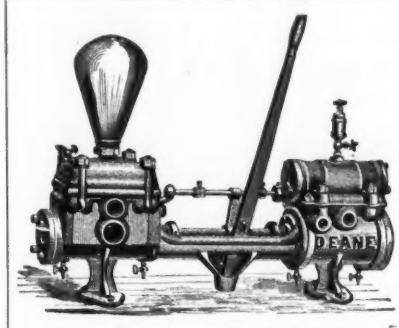

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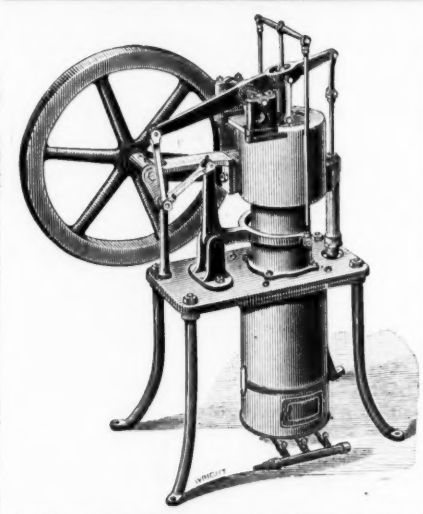

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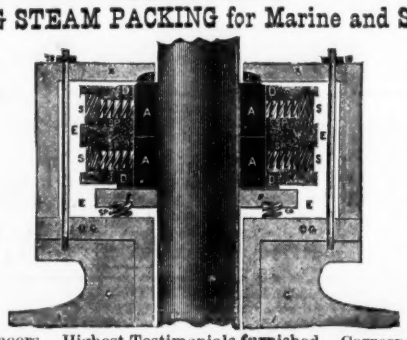

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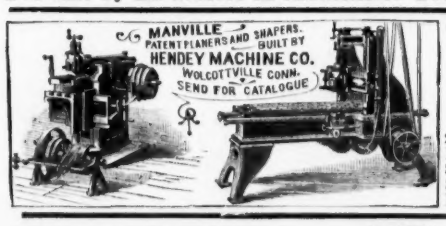

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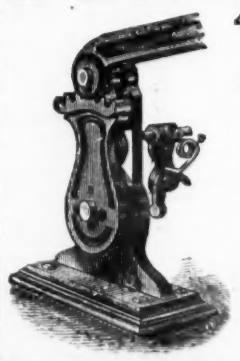

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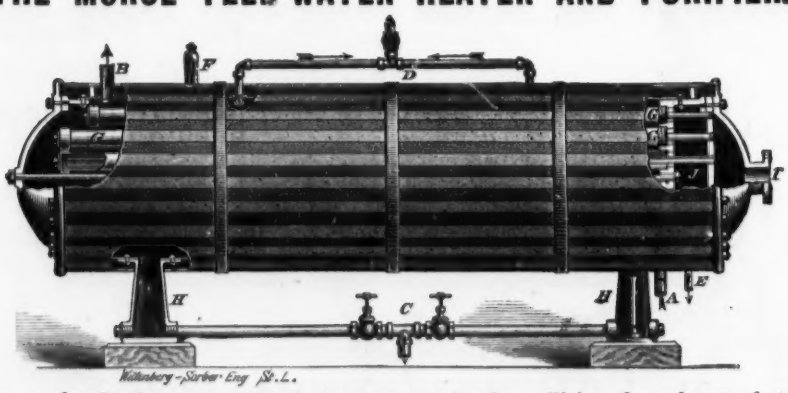

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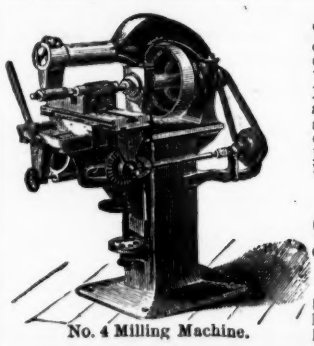

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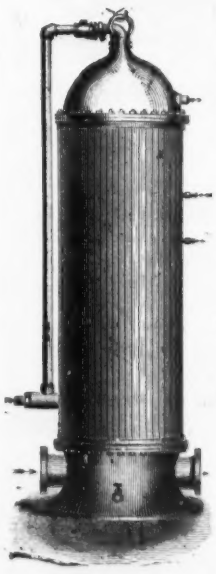

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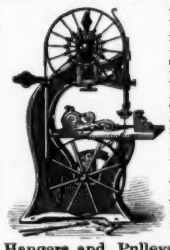

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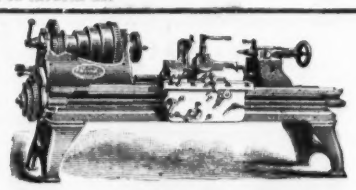

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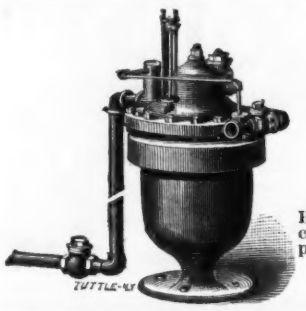

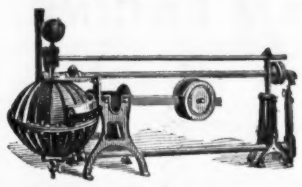

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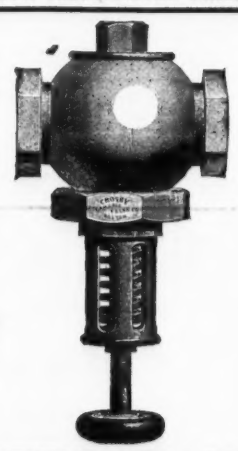

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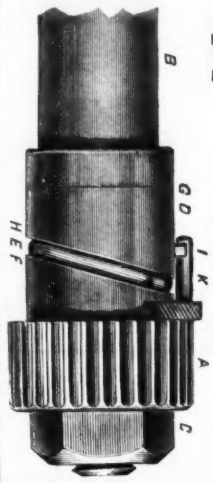

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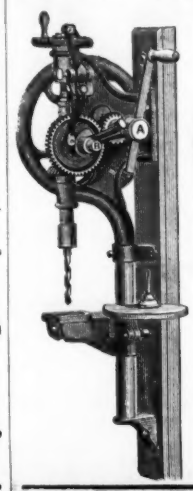

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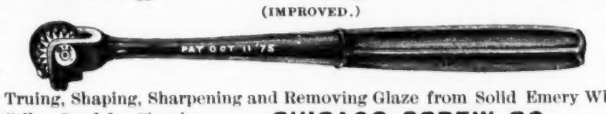

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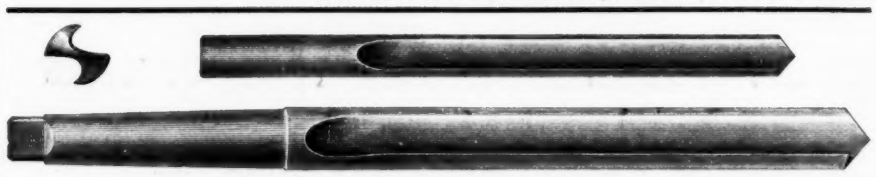

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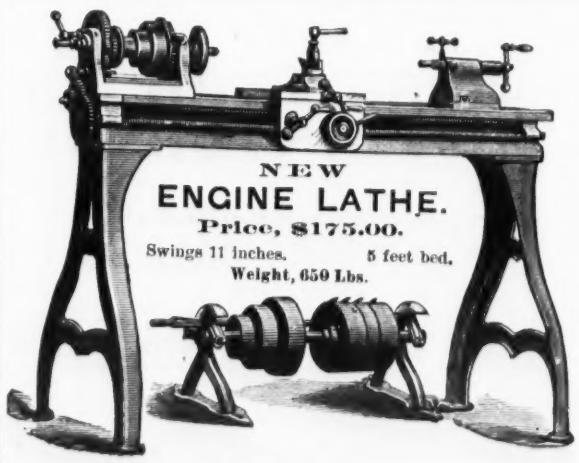

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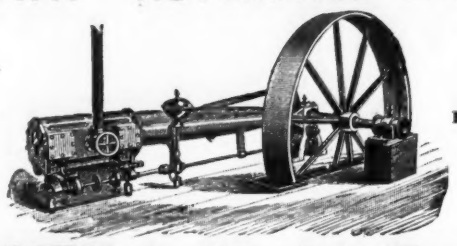

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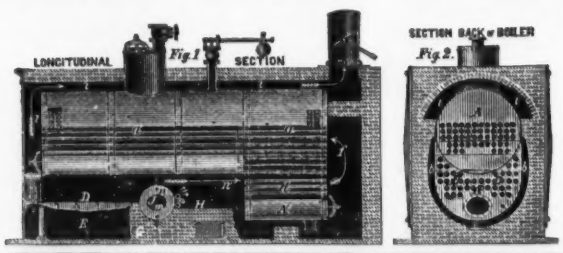

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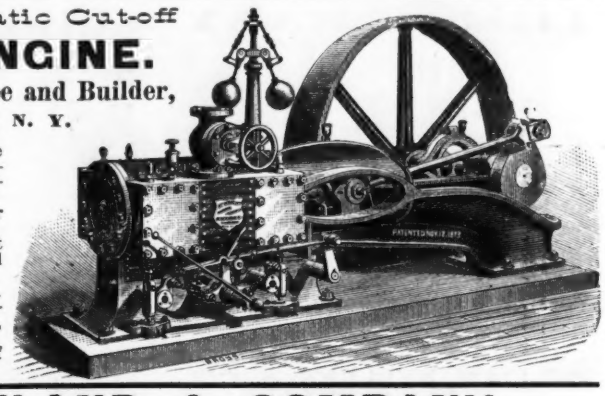

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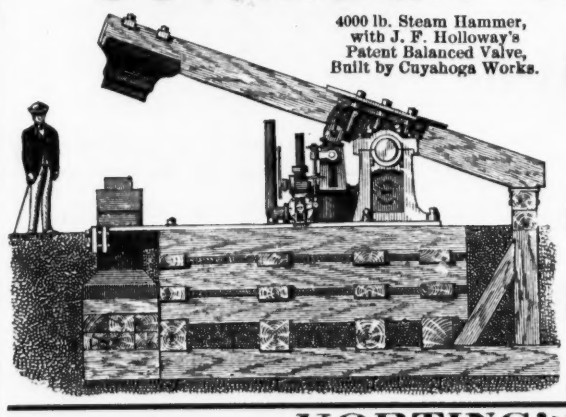

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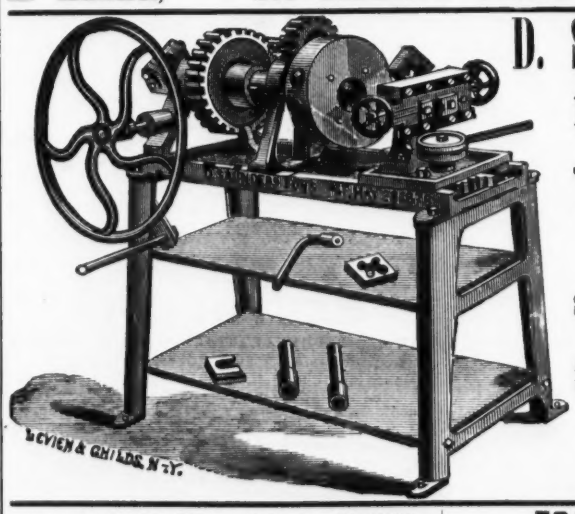

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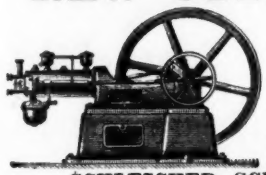

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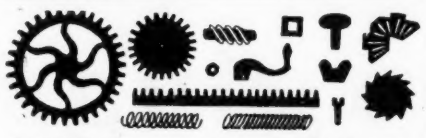

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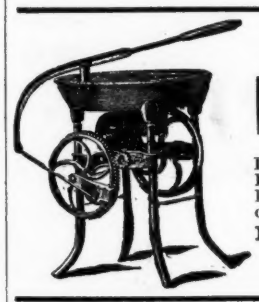

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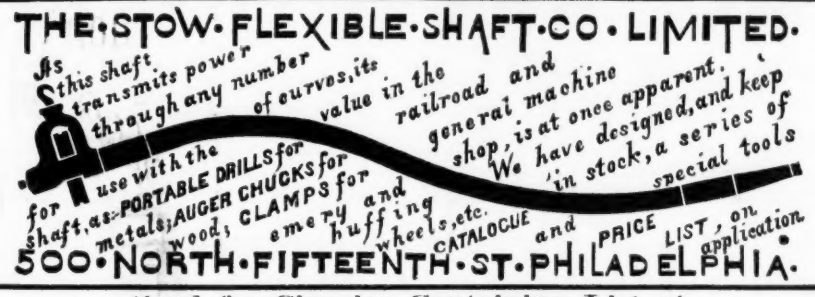
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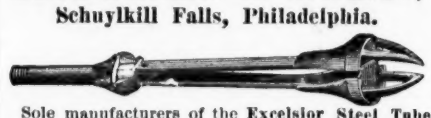

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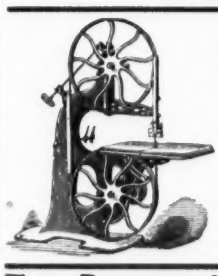

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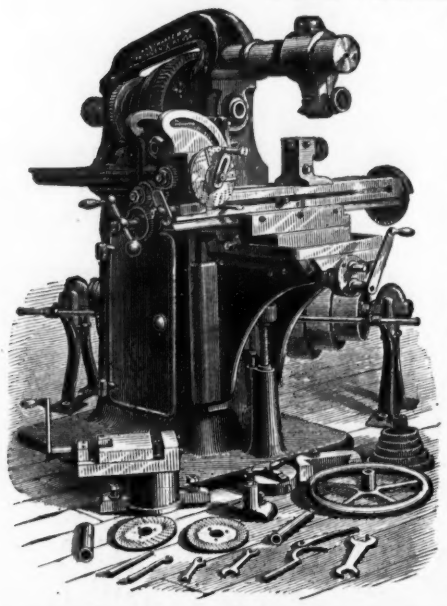

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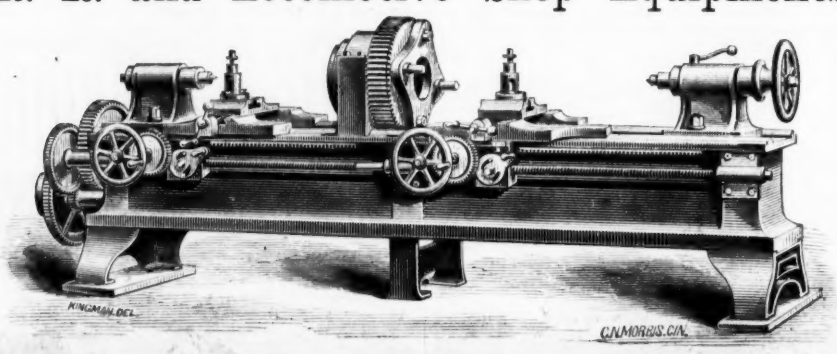

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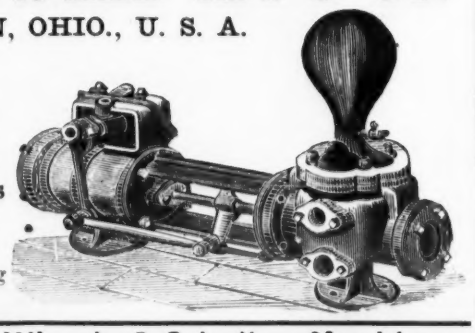

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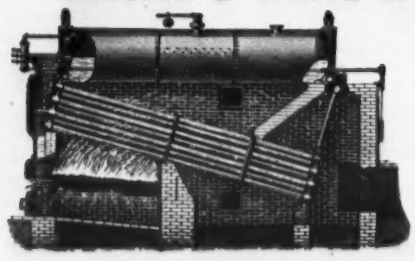

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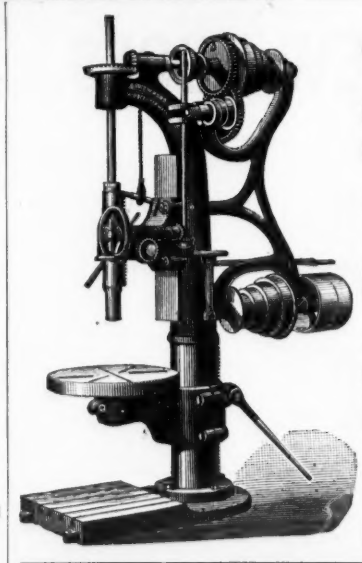

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